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ABSTRACT

Designed to be used with the Association of Research Libraries (ARL) "Preservation Planning Program Manual," this notebook provides access to background and technical information needed for planning and carrying out a variety of preservation programs and activities. Its contents, all drawn from the body of preservation literature available in late 1986 and early 1987, include excerpts and documents that are of particular usefulness and/or difficult to obtain through normal channels, and references to over 200 additional items that are more readily available but are not reproduced here due to length or lack of reproduction permission. An introductory bibliography lists the reproductions and references for each subject area, flagged to indicate basic introductory materials and in-depth or supplementary items. The notebook is divided into the following major subject areas: (1) Introductory Readings; (2) The Physical Environment; (3) Protection of Library Materials; (4) Surveying Collection Conditions; (5) Preservation Organization and Administration; (6) Disaster Prevention and Preparedness; (7) Preservation Microfilming; (8) Cooperative Preservation Activities; (9) Preservation Supplies; (10) Education and Training for Preservation; and (11) Library Materials--Physical Nature and Treatment. (KM)

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PRESERVATION PLANNING PROGRAM

RESOURCE NOTEBOOK

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Compiled by Pamela W. Darling
Revised edition by Wesley L. Boomgaarden

Development supported by a grant from the National Endowment for the Humanities

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PRESERVATION PLANNING PROGRAM RESOURCE NOTEBOOK

INTRODUCTION

The revised edition of this notebook, like the original 1982 edition is is replacing, was assembled primarily for use with the PRESERVATION PLANNING PROGRAM MANUAL developed and tested by the Association of Research Libraries' Office of Management Studies, with support of a grant from the National Endowment for the Humanities. Its contents should also prove useful to all those involved in preservation work in libraries and archives.

The RESOURCE NOTEBOOK provides access to background and technical information needed for planning and carrying out a variety of preservation programs and activities. It is drawn from the ever-increasing body of preservation literature available in late 1986-early 1987 and consists of two complimentary kinds of information:

1) reproductions of over one hundred articles, excerpts and documents which are of particular usefulness and/or difficult to obtain through normal channels;
2) references to over two hundred additional items which are more readily available, not reproduced in the notebook due to length or lack of reproduction permission.

Like its 1982 edition compiled by Pamela Darling, the notebook is divided into eleven major subject areas. It begins with a bibliography of reproductions and references for each subject, flagged to indicate basic introductory materials and in-depth or supplementary items. The bibliography is followed by the reproductions themselves. Every effort has been made to provide clear copies, but the originals of a few of the materials were less than ideal. They were included despite this problem, because their usefulness seemed to justify the extra effort necessary to read them.

Appreciation is hereby expressed to all those authors, publishers, editors and creators who gave permission for their work to be reproduced in this notebook.

The notebook is distributed unbound.
Users may wish to place sections in separate binders, to which additional materials on each topic may be added in the future.

A Word of Caution to Readers

The literature of the field continues to grow at a rapid pace. As the field matures -- which it has done considerably in recent years -- both the quantity and quality of its literature and documentation is increased. Yet there remains, of course, uneven development in certain areas. Preservation efforts encounter many complex technical, organizational and procedural problems, to which there is as yet no clear consensus about "best" solutions. In short, those using the literature in this notebook must be aware of current development in the field of library and archives preservation and must keep abreast of its ever-increasing efforts.

Wesley L. Boomgaarden
Preservation Officer
The Ohio State University
Libraries
February 1987

PRESERVATION PLANNING PROGRAM RESOURCE NOTEBOOK

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Section 1. INTRODUCTORY READINGS

Items reproduced in this notebook are listed first, followed by references to additional readings for each topic (indicated by "**" in place of a page number). Those appearing in bold face type should be read first; the others provide more extended treatments or differing points of view.

PAGE

1 Council on Library Resources. Committee on Preservation and Access. BRITTLE BOOKS: REPORTS OF THE COMMITTEE ON PRESERVATION AND ACCESS. Washington, DC: CLR, 1986.

17 Cunha, George M. "What an Institution Can Do to Survey its Conservation Needs," Andover, MA: Northeast Document Conservation Center, 1982.

24 _______, & Sherelyn Ogden. "From Problems Perceived to Programs in Practice: the Preservation of Library Materials in the USA, 1956 - 1980," LIBRARY RESOURCES & TECHNICAL SERVICES, 25:9-29 (Jan/Mar 1981).

35 **Merrill-Oldham, Jan. "Preservation Comes of Age: An Action Agenda for the 80's and Beyond," AMERICAN LIBRARIES 16:770-772 (December 1985).**

38 _______. "Preservation in Research Libraries: A New Approach to Caretaking," HARVEST, a semi-annual newsletter of the University of Connecticut Libraries, Spring 1985, pp.1-3.

Articles

** Baker, John P. "Conservation & Preservation of Library Materials," ALA WORLD ENCYCLOPEDIA. Chicago: American Library Association, 1980. pp.160-164.

** Banks, Paul N. THE PRESERVATION OF LIBRARY MATERIALS. Chicago: The Newberry Library, 1978. (also appears in ENCYCLOPEDIA OF LIBRARY AND INFORMATION SCIENCE, NY: Marcel Dekker, 1969- v.23, p.180-222)

** Barker, Nicholas. "Conservation and Preservation, A Problem of Library Management: A British Library View," LIBRI, 31:193-197 (September 1981).

** Battin, Patricia. "Preservation: the Forgotten Problem" in Thomas J. Galvin and Beverly Lynch, eds. NEW DIRECTIONS FOR HIGHER EDUCATION: PRIORITIES FOR ACADEMIC LIBRARIES, no. 39, San Francisco: Jossey-Bass, 1982, pp.61-69.

** **Darling, Pamela W. "Our Fragile Inheritance: the Challenge of Preserving Library Materials," 1978 ALA YEARBOOK. Chicago: American Library Association, 1978. pp.xxxi-xlii.**

** Hazen, Dan C. "Collection Development, Collection Management and Preservation," LIBRARY RESOURCES & TECHNICAL SERVICES 26:3-11 (Jan/Mar 1982).

** Lundeen, Gerald, ed. "Conservation of Library Materials," LIBRARY TRENDS, Vol. 30, No. 2, Fall 1981, 317 pp. The entire issue is devoted to the topic of conservation.

** Wessel, Carl J. "Deterioration of Library Materials," ENCYCLOPEDIA OF LIBRARY AND INFORMATION SCIENCE, 1972. Vol 7, pp.69-120.

** Williams, Edwin E. "Deterioration of Library Collections Today," LIBRARY QUARTERLY, 40:3-17 (Jan 1970).

(Section 1 continued on next page)

Section 1, continued

Books

** Baker, John P. and Marguerite C. Soroka, eds. LIBRARY CONSERVATION: PRESERVATION IN PERSPECTIVE. Stroudsburg, PA: Dowden, Hutchinson & Ross, 1978. 459p.

** CONSERVING AND PRESERVING LIBRARY MATERIALS. Edited by Kathryn Luther Henderson and William T. Henderson. Champaign, IL: University of Illinois, Graduate School of Library Science (Allerton Park Institute, No. 27), 1983. 207pp.

** Cunha, George M. and Dorothy Grant Cunha, with the assistance of Suzanne Elizabeth Henderson. LIBRARY AND ARCHIVES CONSERVATION: 1980'S AND BEYOND. Metuchen, NJ: Scarecrow, 1983, 2 Vols., 645p.

** Merrill-Oldham, Jan and Merrily Smith, editors. THE LIBRRARY PRESERVATION PROGRAM: MODELS, PRIORITIES, POSSIBILITIES. Chicago: American Library Association, 1985. 117pp.

** Morrow, Carolyn Clark, with Gay Walker. Introduction by Pamela W. Darling. THE PRESERVATION CHALLENGE: A GUIDE TO CONSERVING LIBRARY MATERIALS. White Plains, NY: Knowledge Industry Publications. 1983. 231p.

** National Conservation Advisory Council. REPORT OF THE STUDY COMMITTEE ON LIBRARIES AND ARCHIVES: NATIONAL NEEDS IN LIBRARIES AND ARCHIVES CONSERVATION. Washington, DC: National Conservation Advisory Council, 1978. 56pp.

** ORGANIZING FOR PRESERVATION IN ARL LIBRARIES, SPEC Kit #116. Washington, DC: Association of Research Libraries, 1985. 131 pp.

** PRESERVATION OF HISTORICAL RECORDS. Washington, DC: National Academy Press, 1986. 108pp.

** RLG PRESERVATION MANUAL. 2nd ed. Stanford, CA: The Research Libraries Group, Inc., 1986.

** Robert, Matt T. and Don Etherington. BOOKBINDING AND CONSERVATION OF BOOKS: A DICTIONARY OF DESCRIPTIVE TERMINOLOGY. Washington, DC: Library of Congress, 1982.

** Swartzburg, Susan G., editor. CONSERVATION IN THE LIBRARY: A HANDBOOK IN THE USE AND CARE OF TRADITIONAL AND NONTRADITIONAL MATERIALS. Westport, CT: Greenwood Press, 1983. 234pp.

** __________. PRESERVING LIBRARY MATERIALS: A MANUAL. Metuchen NJ: Scarecrow Press, 1980. 282pp.

Bibliographies

** Banks, Paul N. A SELECTIVE BIBLIOGRAPHY OF MATERIALS IN ENGLISH ON THE CONSERVATION OF RESEARCH LIBRARY MATERIALS. Chicago: The Newberry Library, 1981.

** "Basic Preservation Bibliography," compiled by the Preservation of Library Materials Section, Resources and Technical Services Division, American Library Association, 1983 (or latest revision).

** Byrnes, Margaret M. "Preservation of Library Materials: 1981," LIBRARY RESOURCES & TECHNICAL SERVICES 26: 223-239 (July/September 1982).

** __________. "Preservation of Library Materials: 1982," LIBRARY RESOURCES & TECHNICAL SERVICES 27: 297-314 (July/September 1983).

** Cunha, George and Dorothy G. Cunha, with the assistance of Suzanne Elizabeth Henderson. LIBRARY CONSERVATION: 1980'S AND BEYOND. Vol. II: Bibliography. Metuchen, NJ: Scarecrow, 1983.

(Section 1 continued on next page)

Section 1, continued

- ** Fox, Lisa L. "A Two-Year Perspective on Library Preservation : An Annotated Bibliography," LIBRARY RESOURCES & TECHNICAL SERVICES 30: 290-318 (July/September 1986).
- ** Morrow, Carolyn L. and Steven B. Schoenly. A CONSERVATION BIBLIOGRAPHY FOR LIBRARIANS, ARCHIVISTS AND ADMINISTRATORS. Troy, NY: Whitston, 1979.
- ** "Preservation of Library Materials: First Sources," Preservation Leaflet 1. Washington, DC: Library of Congress, 1982 (or latest revision).
- ** RLG PRESERVATION MANUAL, 2d ed. "Appendix B. A Preservation Workbook." Stanford, CA: The Research Libraries Group, Inc., 1986, pp.89-182.

SOME IMPORTANT JOURNALS IN CONSERVATION AND PRESERVATION

ABBEY NEWSLETTER
c/o Preservation Department
6216 HBLL
Brigham Young University
Provo, UT 84602

American Institute for Conservation of
Historic and Artistice Works. JOURNAL
Executive Secretary, AIC
3545 Williamsburg Lane N.W.
Washington, DC 20008

CONSERVATION ADMINISTRATION NEWS
McFarlin Library
University of Tulsa
600 South College
Tulsa, OK 74104

LIBRARY RESOURCES & TECHNICAL SERVICES
Resources and Technical Services Division
American Library Association
50 East Huron Street
Chicago, IL 60611

NATIONAL PRESERVATION NEWS
National Preservation Program Office
LM G07
Library of Congress
Washington, DC 20540

THE NEW LIBRARY SCENE
Library Binding Institute
150 Allens Creek Road
Rochester, NY 14618

(Section 1 continued on next page)

Section 1, continued

PHOTOGRAPHICONSERVATION
Technical & Educational Center of the Graphic Arts
Rochester Institute of Technology
One Lomb Memorial Drive
Rochester, NY 14623

STUDIES IN CONSERVATION
International Institute for the Conservation
of Historic and Artistic Works
6 Buckingham Street
London WC2N 6BA, England

TECHNOLOGY AND CONSERVATION
The Technology Organization, Inc.
One Emerson Place
Boston, MA 02114

Section 2: THE PHYSICAL ENVIRONMENT

Items reproduced in this notebook are listed first, followed by references to additional readings for each topic (indicated by "**" in place of a page number). Those appearing in bold face type should be read first; the others provide more extended treatments or differing points of view.

PAGE

Environmental Conditions

41 **Banks, Paul N. "Environmental Standards for Storage of Books and Manuscripts," LIBRARY JOURNAL 99:339-343(February 1, 1974).**

A lucid review of "all those factors which might be included in building planning which can influence the preservation, deterioration or destruction of books."

46 "Emergency Building Temperature Restrictions," ALA WASHINGTON NEWSLETTER, July 17, 1979, p.2ff.

Includes text of the American Library Association statement to the US Department of Energy on the environmental needs of collections. Although emergency energy conservation regulations have since been lifted by the federal government, the documentation included here may be useful for institutions affected by local energy restrictions.

49 "ENVIRONMENTAL SPECIFICATIONS FOR THE STORAGE OF LIBRARY & ARCHIVAL MATERIALS," Leaflet #1. SOLINET Preservation Program. Atlanta: Southeastern Library Network, Inc., 1985.

Brief summary of environmental specifications for temperature, relative humidity, air pollution and light.

54 **Lafontaine, Raymond H. ENVIRONMENTAL NORMS FOR CANADIAN MUSEUMS, ART GALLERIES AND ARCHIVES. Technical Bulletin 5. Ottawa: Canadian Conservation Institute, 1979.**

A succinct statement of Canadian "norms" for safe storage and exhibition of materials; very applicable to libraries.

57 Macleod, K.J. RELATIVE HUMIDITY: ITS IMPORTANCE AND CONTROL IN MUSEUMS. Technical Bulletin 1. Ottawa: Canadian Conservation Institute, 1978.

Detailed and lucid technical discussion of what relative humidity is, how it affects materials, optimum ranges for various materials, methods of measurement and control. Aimed at museum audiences, but applicable to libraries as well.

** AIR QUALITY FOR STORAGE OF PAPER-BASED ARCHIVAL RECORDS. Prepared for the Public Buildings Service, General Services Administration and the National Archives and Records Service, Washington, DC. Published as NBSIR 83-2795, available from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal, Springfield, VA 22161. November 1983.

"Criteria for temperature, relative humidity, and gaseous and particulate contaminant concentrations are proposed for spaces used for storage and preservation of paper-based archival records. The criteria are based on available information from the literature, and recommendations of the January 19-20, 1983, National Bureau of Standards Workshop on Environmental Conditions for Archival Storage ..."

(Section 2 continued on next page)

Section 2, continued

** BUILDING MAINTENANCE AND PRESERVATION. Edward D. Mills, ed., London: Butterworths, 1980.
"Essays on maintenance design and practice in existing and sometimes historic buildings."

** "Controlled Environment Vital for Collections' Conservation," from Guldbeck, Per E., THE CARE OF ANTIQUES AND HISTORICAL COLLECTIONS. 2d. ed., revised and expanded by A. Bruce MacLeish. Nashville: American Association for State & Local History, 1985. pp.19-33.
Summary of environmental needs of various materials.

** Oxley, Thomas A. and Ernest G. Gobert. DAMPNESS IN BUILDINGS. London: Butterworths, 1983.
"A professional's and homeowners' guide to the nature of dampness; how to diagnose it before it gets out of hand and how to deal with it, including differentiating between rising damp and condensation."

** PAPER AND ITS PRESERVATION: ENVIRONMENTAL CONTROLS. Preservation Leaflet No. 2, Washington, DC: Library of Congress, 1983 (or latest update).
Introduction to the causes of paper deterioration and effects of environmental factors on the condition of materials; covers temperature, humidity, mold, atmospheric pollutants, light, insects, rodents and a brief listing of supply sources.

** Staveley, H.S. and P.V. Glover. SURVEYING BUILDINGS. London: Butterworths, 1983.
"An up-to-date guide to the principles and practices of building inspection. Covers all the main structural and non-structural building elements and discusses preparation of reports in detail."

** Thomson, Garry. THE MUSEUM ENVIRONMENT. London and Boston: Butterworths, 1978, 1981. 2d ed. in press.
An updated edtion of a standard text on the museum (and library) environment.

** Trinkhaus-Randall, Gregor. EFFECTS OF THE ENVIRONMENT ON PAPER: A REVIEW OF RECENT LITERATURE. Technical Leaflet 128. Nashville, American Association of State and Local History, 1980.
Covers the nature of paper and the effects on it of temperature, humidity, light and atmospheric pollution, reviewing the developments in understanding about these effects and suggesting methods of control. Includes an extensive bibliography.

** Wessel, Carl J. "Environmental Factors Affecting the Permanence of Library Materials," LIBRARY QUARTERLY 40:39-84 (Jan 1970).

Light

72 Lafontaine, Raymond H. & Patricia A. Wood. FLUORESCENT LAMPS. Technical Bulletin 7. Ottawa: Canadian Conservation Institute, 1980.
"The operation and visual characteristics of fluorescent lamps are reviewed with special consideration given on how to choose the right lamp for a particular application." Tables compare the ultraviolet radiation emission of 114 lamps tested in CCI labs.

86 "A Lesson in Lighting," HISTORY NEWS, February 1981, pp.45-77.
Discusses basic light theory, measuring and controlling light, and supply sources, focusing on exhibited materials.

(Section 2 continued on next page)

Section 2, continued

89 "Measuring Foot-Candles with a Photographer's Light Meter," from 1979 seminar notes, Conservation Center for Art & Historic Artifacts.
Brief instructions for measuring visible light.

** Thomson, Garry. THE MUSEUM ENVIRONMENT. London and Boston: Butterworths, 1978, 1981. 2d ed. in press.
An extended treatment of light, with some applications for libraries.

Insects

90 "Know your Enemies," NEWSLETTER of the Conservation Center for Art and Historic Artifacts, Philadelphia, March 1980, pp.6-7.
"Brief description of insects that may be encountered in a collection, and the types of damage they may cause."

92 "Pest Control," CCAHA, 1980.

** "A Current Status Report on Fumigation in Museums and Historical Agencies." Technical Report 4. Nashville: American Association for State and Local History, 1986 (?).

** Story, Keith O. APPROACHES TO PEST MANAGEMENT IN MUSEUMS. Suitland, MD: Smithsonian Institution Conservation Analytical Laboratory, 1985.
This excellent book is divided into two parts: Part I is entitled "Biology and Outline Control Measures for Key Insect Pests of Museums." Part II: "Pest Management Approaches." The latter emphasizes non-chemical means of control. The 165-page volume is available free from the Smithsonian's Conservation Analytical Laboratory. It includes an impressive bibliography in each area.

Monitoring

93 "Environment and Security," MUSEUM AND ARCHIVAL SUPPLIES HANDBOOK, Toronto, Ontario Museum Association, 1979. 2d ed. pp.74-79.
Descriptions of testing and control equipment and supplies, with price and source information from the 1979 edition of the catalog. A third edition was published in 1985 and is distributed by the American Association for State and Local History (AASLH), Nashville.

99 Lafontaine, Raymond H. RECOMMENDED ENVIRONMENTAL MONITORS FOR MUSEUMS, ARCHIVES AND ART GALLERIES. Technical Bulletin 3. Ottawa, Canadian Conservation Institute, 1978. Rev. ed.
"Instruments for monitoring ... relative humidity, temperature, lighting and air pollution are described in detail ... A 'kit' of recommended instrumentation is described". Includes illustrations, sample report forms, and an extensive listing of suppliers.

121 "Survey Form A: General" and "Survey Form B: Conditions in Storage and Exhibition Rooms," Northeast Document Conservation Center.
Sample forms for recording basic environmental data.

Section 3: PROTECTION OF LIBRARY MATERIALS

Items reproduced in this notebook are listed first, followed by references to additional readings for each topic (indicated by "**" in place of a page number). Those appearing in bold face type should be read first; the others provide more extended treatments or differing points of view.

Storage & Handling

PAGE	
123	"Basic Principles of Storage." Bulletin No. 1. New York: Cooper-Hewitt Museum - New York State Conservation Consultancy, 1986. Primary emphasis is on museum artifacts, but with general applicability for library and archival collections.
129	"Food and Drink." Preservation Flyer No. 5. Ann Arbor: The University of Michigan Library Preservation Office, 1985.
130	"Handling Books" and "Stack Maintenance," from THE RLG PRESERVATION MANUAL. 2d. ed. Stanford: The Research Libraries Group, Inc., 1986. Appendix B: pp. 107-109; 143-145.
136	**"Maintenance of Library Materials", Andover, Northeast Document Conservation Center, 1981.**
142	"Notes on Preservation," from THE PRESERVATION OF LIBRARY MATERIALS: A CUL HANDBOOK. GUIDELINES AND PROCEDURES. New York: Columbia University Libraries Preservation Department, 1985.
147	"Pamphlet Storage System", Philadelphia: Conservation Center for Art and Historic Artifacts, 1980.
149	**"Preservation Guidelines for Processing Staff." Module 1 from PRESERVATON OF LIBRARY MATERIALS: A MANUAL FOR STAFF. Austin: The General Libraries, The University of Texas, (draft) 1986.**
167	**"Storage of Library Materials", Andover: Northeast Document Conservation Center, 1981.**
**	**Banks, Paul N. "Handling and Storage Practices" from THE PRESERVATION OF LIBRARY MATERIALS. Chicago, Newberry Library, 1978. pp.11-20 (also published in ENCYCLOPEDIA OF LIBRARY AND INFORMATION SCIENCE, NY: Marcel Dekker, 1969-, v.23, pp.180-222).**
**	BOXES FOR THE PROTECTION OF RARE BOOKS: THEIR DESIGN AND CONSTRUCTION. Compiled by Margaret R. Brown. Washington: Library of Congress Preservation Office, 1981.
**	**MATTING AND HINGING WORKS OF ART ON PAPER. Compiled by Merrily A. Smith. Washington: Library of Congress Preservation Office, 1981.**
**	POLYESTER FILM ENCAPSULATION. Washington: Library of Congress, 1980.
**	"Shelving & Handling", and "Protective Treatment of Library Materials", in BASIC PRESERVATION PROCEDURES, SPEC Kit #70. Washington: Association of Research Libraries, 1981. pp.1-66.
**	**"Staff Training," from PRESERVATION EDUCATION IN ARL LIBRARIES. SPEC Kit 113. Washington, DC: ARL, 1985. pp.13-74.**
**	USE OR ABUSE: THE ROLE OF STAFF AND PATRONS IN MAINTAINING GENERAL LIBRARY COLLECTIONS. Videotape. Carbondale, IL: Illinois Cooperative Conservation Program, 1986.

(Section 3 continued on next page)

Section 3, continued

Exhibits

171 "Book Cradles -- Book Display and Safety," Philadelphia: Conservation Center for Art and Historic Artifacts, 1983.

172 "Exhibits," from THE RLG PRESERVATION MANUAL. 2d. ed. Stanford: The Research Libraries Group, Inc. 1986. Appendix B: pp.140-142.

** Blair, C. Dean. "Protecting Your Exhibits: Security Methods and Devices", Technical Leaflet #99. Nashville, American Association for State and Local History, 1977.

** Casterline, Gail Farr. "Conservation", in ARCHIVES AND MANUSCRIPTS: EXHIBITS. Chicago, Society of American Archivists, 1980. (SAA Basic Manual Series) pp.19-22.

** EXHIBITS. SPEC Kit 120. Washington, DC: ARL, 1986.

** Stolow, Nathan. PRACTICAL GUIDE TO THE CARE AND HANDLING OF EXHIBITIONS. New York: Unipub, 1981.

Educating Patrons about Preservation

175 Buchanan, Sally and Walter Henry. USERS' GUIDE TO THE CONSERVATION OF LIBRARY MATERIALS. Stanford: Stanford University Libraries, 1980.

185 Posters from South Dakota State University Library.

** CONSERVATION AND PRESERVATION AT YALE. [Exhibit catalog] New Haven: Yale University Libraries, 1981.

** "Reader Education," and "Donors: General Information and Appeals for Support." from PRESERVATION EDUCATION IN ARL LIBRARIES. SPEC Kit 113. Washington, DC: ARL, 1985. pp.75-91.

Security

186 "Security of Collections," from THE RLG PRESERVATION MANUAL 2d. ed. Stanford: The Research Libraries Group, Inc., 1986. Appendix B: pp.128-31.

** Sable, Martin. THE PROTECTION OF THE LIBRARY AND ARCHIVE: AN INTERNATIONAL BIBLIOGRAPHY. New York: Haworth Press, 1984. Also published in LIBRARY AND ARCHIVAL SECURITY 5: No.2-3 (Summer/Fall 1984).

Section 4: SURVEYING COLLECTION CONDITIONS

Items reproduced in this notebook are listed first, followed by references to additional readings for each topic (indicated by "**" in place of a page number). Those appearing in bold face type should be read first; the others provide more extended treatments or differing points of view.

PAGE

Survey Techniques

189 **Buchanan, Sally and Sandra Coleman. DETERIORATION SURVEY OF THE STANFORD UNIVERSITY LIBRARIES GREEN LIBRARY STACK COLLECTION. Unpublished report, Stanford University Libraries, 1979.**

Excellent account of a random sample survey, complete enough to be used as a model by others.

222 "Sorting Books and Identifying Problems," from CLEANING AND PRESERVING BINDINGS AND RELATED MATERIALS, by Carolyn Horton. Chicago, American Library Association, 1969. 2d ed. pp.9-20.

Detailed, illustrated procedure for examining books to determine preservation treatment needs.

234 "Survey Form C-1: Conditions of the Collections" and "Survey Form C-2: Report on Collections." Northeast Document Conservation Center.

Two approaches to reporting collection conditions.

236 "Sample Examination Form for Paper Objects," Smithsonian Institution.

An approach for documenting in detail the condition of paper artifacts.

242 "Survey of Book Condition at the Library of Congress," NATIONAL PRESERVATION NEWS: A NEWSLETTER OF THE NATIONAL PRESERVATION PROGRAM OFFICE. Washington, DC: The Library of Congress No. 1:8-9 (July 1985).

244 **Walker, Gay, Jane Greenfield, John Fox, and Jeffrey S. Simonoff. "The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library," COLLEGE & RESEARCH LIBRARIES 46:111-132 (March 1985).**

Essential reading before undertaking any condition survey.

** "Condition Survey" form, from SIMPLE REPAIR AND PRESERVATION TECHNIQUES FOR CURATORS, LIBRARIANS AND ARCHIVISTS, by Jean Gunner. Pittsburgh, Hunt Institute for Botanical Documentation, 1981.

Another sample format for recording physical characteristics.

** King, Richard G. DETERIORATION OF BOOK PAPER: RESULTS OF PHYSICAL AND CHEMICAL TESTING OF THE PAPER IN 2280 MONOGRAPHS FROM THE COLLECTIONS OF THE UNIVERSITY OF CALIFORNIA LIBRARIES. Berkeley: University of California Systemwide Administration, Office of Library Plans and Policies, 1981.

Report of a research project, with detailed descriptions of paper testing techniques.

** Magrill, Rose Mary and Constance Rinehart, "Selection for Preservation: A Service Study," LIBRARY RESOURCES AND TECHNICAL SERVICE, 24:44-57 (Winter 1980).

Describes a rating scale and sampling approach used in evaluating the physical condition of books.

(Section 4 continued on next page)

Section 4, continued

** McCrank, Lawrence J. "Integrating Conservation and Collection Management: An Experimental Workshop Report," LIBRARY AND ARCHIVAL SECURITY 6:23-48 (Spring 1984).

** "Physical Inspection of Microforms," from THE EVALUATION OF MICROPUBLICATIONS: A HANDBOOK FOR LIBRARIANS, by Allen B. Veaner. Chicago, American Library Association, 1971. pp.28-48.
How to determine the physical quality of microforms.

** Pyatt, Timothy. "dBase III for Conservation Surveys," THE ABBEY NEWSLETTER 9:81-82 (September 1985).

** Shaffer, Norman J. "Library of Congress Pilot Preservation Project," COLLEGE & RESEARCH LIBRARIES, Jan 1969, pp.5-11.
Report of a project investigating the comparative condition of books in the Library of Congress and seventy other US Libraries. Includes "book condition report form."

** Tomer, Christinger. "Identification, Evaluation and Selection of Books for Preservation," COLLECTION MANAGEMENT 3:45-54 (Spring 1979).

Sampling Methodology

** Drott, Carl M. "Random Sampling: a Tool for Library Research," COLLEGE & RESEARCH LIBRARIES, March 1969, pp.119-125.
A good introduction to the subject.

** Goldstein, Marianne and Joseph Sedransk. "Using a Sample Technique to Describe Characteristics of a Collection," COLLEGE & RESEARCH LIBRARIES May 1977, pp.195-202.
Describes a systematic sampling technique, with appendix discussing the determination of sampling size.

** "Statistical Significance of Hypothesis Testing," "Using a Table of Random Numbers," and "One Thousand Random Digits," from RESEARCH METHODS IN LIBRARIANSHIP: TECHNIQUES AND INTERPRETATION by Charles H. Busha and Stephen P. Harter. New York, Academic Press, 1980. pp.40-42, 297-317, and 395.
The first section discusses several basic statistical concepts and methods; the second provides concise instructions for using a random number table for selecting a random sample.

Section 5: PRESERVATION ORGANIZATION AND ADMINISTRATION

Items reproduced in this notebook are listed first, followed by references to additional readings for each topic (indicated by "**" in place of a page number). Those appearing in bold face type should be read first; the others provide more extended treatments or differing points of view.

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264 National Archives and Records Service. TWENTY-YEAR RECORDS PRESERVATION PLAN. Washington, DC: NARS, 1984.

269 **Morrow, Carolyn Clark. "Philosophy," "Collections Maintenance" and "Organization of the Conservation Department" from A CONSERVATION POLICY STATEMENT FOR RESEARCH LIBRARIES. Occasional Papers 139. Urbana: University of Illinois Graduate School of Library Science, 1979. pp.2-7, 15-18.**

Covers philosophy, collections maintenance, treatment, disaster preparedness, outreach, and the organization of a conservation department.

279 **Patterson, Robert H. "Organizing for Conservation: A Model Charge to a Conservation Committee" LIBRARY JOURNAL, May 15, 1979, pp. 1116-19.**

Discusses the value of a committee in initiating preservation activities, and presents ten elements in a charge.

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Discusses elements in a comprehensive preservation program and suggests a planning and implementation strategy.

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** McCrank, Lawrence J. "Collection Management and Preservation," in PRESERVING AMERICA'S PERFORMING ARTS (Barbara Cohen-Stratyner and Brigitte Kueppers, eds.) New York: Theatre Library Association, 1985. pp.98-101.

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** ORGANIZING FOR PRESERVATION IN ARL LIBRARIES. SPEC Kit 116. Washington, DC: ARL, 1985.

Organizational documents relating to preservation in 15 ARL libraries; includes organizational structure, position descriptions, unit descriptions, committee reports.

** "Policies that Shape Preservation Decision Making," from PRESERVATION EDUCATION IN ARL LIBRARIES. SPEC Kit 113. Washington, DC: ARL, 1985, pp.1-12.

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Descriptions of Library Preservation Programs

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Organizational Documents

301 Organization charts from Emory University Libraries, the New York Public Library and Yale University Library, 1986.

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Compiled in 1985, a very useful look at how -- and at what place in the organizational structure -- several ARL libraries have established preservation department. Along with patterns of descriptions for numerous preservation-related positions at Brigham Young, UC-Berkeley, Chicago, Columbia, Connecticut, Iowa, Michigan, Stanford, Southern Illinois, Texas-Austin, Virginia, and Yale.

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Section 6: DISASTER PREVENTION & PREPAREDNESS

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319	**Murray, Toby. BASIC GUIDELINES FOR DISASTER PLANNING IN OKLAHOMA. Tulsa: Disaster Preparedness Committee, Oklahoma Conservation Congress. 1986.**
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364 Darling, Pamela W. "Developing a Preservation Microfilming Program," LIBRARY JOURNAL 99: 2803-2809 (Nov. 1, 1974). With update: "Searching for Available Replacement Copies: Sources" by Wesley L. Boomgaarden.

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Section 10: EDUCATION AND TRAINING FOR PRESERVATION

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**	PRESERVATION EDUCATION IN ARL LIBRARIES. SPEC Kit 113. Washington, DC: ARL, 1985. An excellent source, with sections on "Policies That Shape Preservation Decision Making," "Staff Training," "Reader Education," "Donors: General Information and Appeals for Support," and "Exhibits."

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Section 11: LIBRARY MATERIALS: PHYSICAL NATURE & TREATMENT

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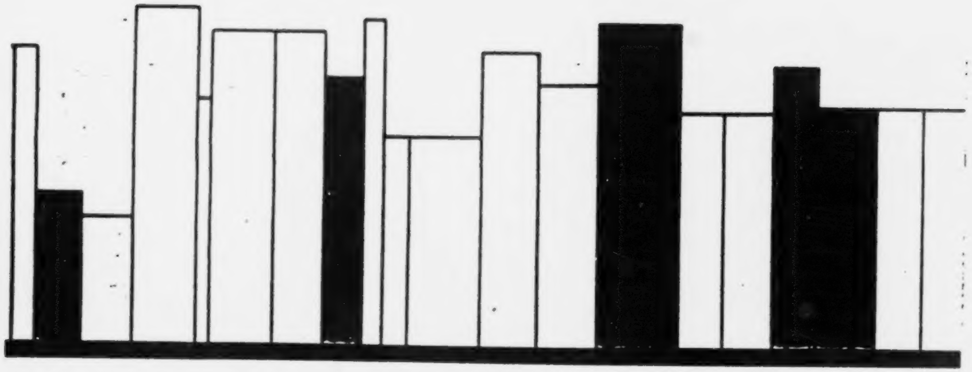

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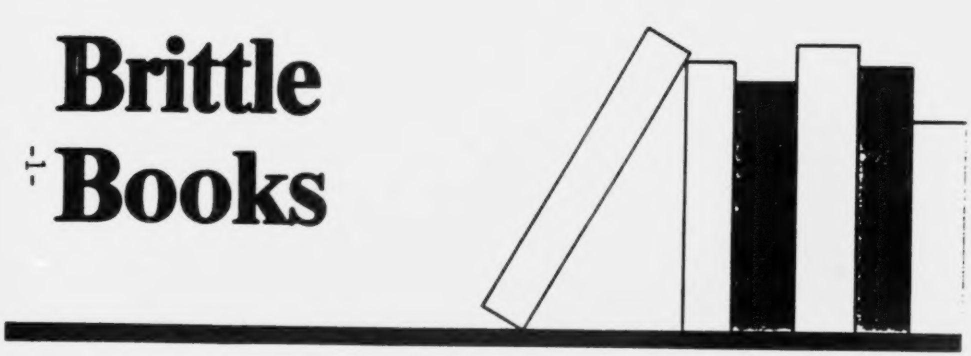

Reports of the Committee on Preservation and Access

Brittle Books

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Preservation and Access

Council on Library Resources
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Introduction

The reports included in this publication reflect the work of the Preservation and Access Committee over a period of eighteen months. They also cap a series of events that began in December 1982 with Forum I, a meeting of librarians, faculty, and university and foundation officers who were asked to consider the changing character of research libraries and the future needs of their users. The subject of preservation was one of the principal topics introduced at that meeting. During the intervening time of somewhat more than three years, attention to preservation has steadily increased. Each year additional libraries and archives become actively involved, and a growing number of individuals are at work in this important arena. The true nature of the preservation problem has also come into sharper focus; preservation has many aspects, each requiring attention of a specific kind. Examples include greater use of acid-free paper in new publications, conservation of important books and manuscripts, attention to storage conditions, deacidification of books and other materials, research into the durability of information stored on computer tape or optical disk, and training of technical specialists.

Forum II, held in October 1983, concentrated on the national and regional aspects of collecting and preserving library materials, and specified several matters for prompt attention. At the request of participants, the Council on Library Resources agreed to take the lead in getting work under way and subsequently proposed to library and academic organizations that a Committee on Preservation be formed and assigned the tasks of devising the management structure, outlining a funding plan, and setting the characteristics of and conditions for a national program. Necessary funding for the work of the Committee was provided by the Exxon Education Foundation, and the Committee itself began to take shape in June of 1984. Billy E. Frye, Vice President for Academic Affairs and Provost of the University of Michigan, agreed to serve as chairman.

One of the most persistent and complicated elements of the preservation problem concerns "brittle books," the shorthand term for past publications produced on acid paper and now so deteriorated that they must be reproduced in some form or eventually they will be lost. The task of finding a reasonable way to deal with brittle books was assumed by the Committee, appropriately renamed the Committee on Preservation and Access to reflect the true nature of its assignment. The report that follows (with the Interim Report included as an appendix) identifies the essential elements of a brittle book preservation program and proposes an organizational structure suited to the task.

The conclusions reached by the Committee were considered in detail by the thirty-four individuals who took part in Forum III on March 19-21, 1986, at Wye Plantation. The participants included not only most members of the Committee itself but representatives from nineteen organizations that have indicated support for the brittle books program, as well as several members of the new Commission on Preservation and Access that will assume operating responsibility in the future. A summary of the discussion that took place follows the Committee's report.

In a real sense, the meeting marked an end of basic planning and the beginning of a new period of action. Much hard work lies ahead. While some might view the concentration by the Committee on the matter of brittle books as limiting in the context of all of preservation, the fact is that by focusing on that topic, a remarkable opportunity has emerged—one that shows promise of fostering constructive collaboration among universities and one that will ultimately test the promise of technology as a means for storing and expediting equitable access to information. That same opportunity will also measure the willingness of many libraries and universities to deal finally with the brittle books problem, and will challenge the abilities and vision of the individuals who are part of those institutions.

The work of shaping an agenda for action and proposing the means to carry it out has been, in good part, accomplished. The work of turning plans into reality is now under way. The first meeting of the new Preservation and Access Commission is scheduled for late April, 1986. Funding is being sought for the operation of the Commission itself over three or four years; staffing needs are under consideration; an initial agenda is being outlined; and the magnitude of the job to be done is being further defined. A complementary National Advisory Council on Preservation is being formed and the many organizations that will take part in the work of that Council are now hearing about the substance of Forum III from their representatives.

The participants at Wye reflected for a time on the many examples of recent progress—training programs for preservation specialists, important cooperative microfilming projects, research on technical applications, analytical studies to learn more of the costs and magnitude of the preservation problem, a growing international interest, public information projects, the creation of new microfilming facilities, and the promotion of standards for permanent book paper. The endorsement of the work of the Preservation and Access Committee and the prompt action to put the proposed management structure in place for a long and difficult undertaking expands that list of accomplishments. The messages from Forum III are that preserving, in a useful way, a substantial portion of our intellectual heritage is clearly worth the effort and that the time has come to proceed with the work.

Report Of The Committee On Preservation And Access

THE BRITTLE BOOKS PROBLEM

The human record, in every form, is fragile. Ancient civilizations are reconstructed from fragments; the work of even the most distinguished authors is often scattered and lost; published and archival records of governments, institutions, and organizations tend to lose integrity and utility with time. New formats for information storage, whether magnetic or photographic, are not immune from their own set of hazards. In short, permanence is a relative term and preservation of the record of the past, on even the most selective basis, is a continuing process.

Books have, for centuries, been the principal means for carrying the past to the future and even in the computer era they remain a remarkably useful invention. Like all other media, books are fragile, but the printing of books in editions and the dispersion of copies has compensated for the hazards that face individual volumes. When a single copy is lost, another can usually be located. Even now, books printed three hundred or four hundred years ago, often in very small editions, can still be found in multiple copies.

The assurance implicit in duplication is less comforting, however, for many books printed after 1850. All paper, and thus every book, deteriorates over time. The rate of deterioration varies greatly and is a function of such factors as the chemical characteristics of the paper, the mechanical construction of the volume, storage conditions, and intensity of use. The paper most often used for books manufactured since the mid-nineteenth century tends to be acidic and, for that reason, less stable and durable than earlier, alkaline paper. Careful analytical work undertaken in several leading libraries confirms that books printed on acidic paper begin to deteriorate rapidly fifty years or so after publication.

Because of the size and composition of their collections, old, large, general research libraries are especially hard hit, but no library of record is immune. Typically, one-fourth of the volumes in such libraries are described as brittle—that is, the paper breaks after one or two double folds of a page corner. Further, up to 80 percent of the books in those collections are acid and, without preventive action, eventually all will become brittle. The Library of Congress estimates that 77,000 volumes in its collection move from the "endangered" to the "brittle" category each year.

The problem, overwhelming as it already is, is unlikely to be contained in the near term. The great majority of books published, nationally and internationally, are still on acid paper. While standards for permanent and durable book paper have been set, their acceptance by leading commercial publishers is slow in the U.S. and even less visible abroad. It is difficult to interest the papermaking industry in the cause of preservation, since only a very small portion of paper made in the United States is used in books.

There is no absolute solution to the preservation problem and no single approach to follow. Use of more acid-free paper, worldwide, will bring long-term help. Deacidification of existing books while they are still physically sound will slow deterioration and extend their useful life. Many individual volumes of intrinsic value (e.g., those with important marginal notes; those that are exceptional examples of bookmaking) should be safeguarded as artifacts. But for the greatest portion of books that are already brittle, reproduction of content is the only realistic course of action; otherwise, an important segment of the human record will be lost forever. How this might best be done is the subject of this report.

GENERAL OBSERVATIONS

Committee members considered many aspects of preservation, but concentrated especially on identifying the fundamental issues and the essential characteristics of an effective national undertaking. The starting point was to understand better the magnitude of the brittle books problem. Several research libraries have independently surveyed their collections and others have determined costs of at least some aspects of microfilming and other replication methods, but there has been no comprehensive study of the magnitude, costs, and benefits of a comprehensive program. Robert Hayes was asked to assemble and analyze known information and to provide estimates where needed, in order to reach a reasonable assessment of the dimension of the brittle books problem. His conclusion, based on saving only one-third of the titles now at risk (or to become at risk in the next twenty years) was that $384 million would be required to preserve the content of 3.3 million volumes. (Because so much data concerning costs, duplication of titles among libraries, and benefits are questionable or lacking, Hayes is now engaged in a research project that will provide more facts and new evaluation.)

Despite the inadequacy of much of the basic information, the inescapable fact for the Committee was the great size of the problem and the high cost of a solution. While the cause of preservation alone might justify the effort and expense, it was the recognition that assured access to the most important publications produced over 150 years of history is the true objective and the real justification for a national program. The goal of brittle books preservation is not to reconstitute the collection of each library as it now is, but to create, in effect, a new national library of preserved materials. With that assertion as a base, the Committee went on to establish and encourage action on key program requirements.

- Wide understanding of the preservation problem is necessary if sufficient and continuing financial and institutional support is to be secured.

  With this objective in mind, several Committee members have taken part in academic and library meetings, the Interim Report has been widely distributed, and an hour-long film on preservation has been commissioned for possible use on public television and for distribution to many kinds of audiences nationally. Ultimate responsibility for building and maintaining an informed body of supporters rests with many library, archival, and academic organizations.

- Preservation work should employ the most effective technology available at any given time.

  The work of preservation cannot wait for the "ideal" technology. Production of microfilm copies of text done to established archival standards is still the accepted approach. Preservation is labor-intensive, and there seems little prospect that alternate technologies will reduce initial costs. Prospects are good that optical/digital disk replication systems may offer cost and service advantages in terms of producing, on demand, copies of individual titles, given fully acceptable assurances of the stability and permanence of such disks. It does seem essential that attention be paid to converting master copies of text from one format to another (film to disk, for example), should that prove desirable.

  Given the projected costs and the continuing requirement for program credibility, preservation work must be carried out as economically as possible, in line with realistic qualitative standards. (A detailed study of microfilming practices and procedures is now under way to determine whether personnel costs might be reduced without unduly compromising the quality of microform master copies.)

- An efficient bibliographic system is required.

  Given the dispersion of preservation work, the underlying bibliographic record system must provide accurate and timely information, identifying and locating master copies. The bibliographic system can also be the source of management information for those concerned with the level, distribution, and characteristics of preservation activity. The same bibliographic information must be widely and easily available if the requirements for accessibility are to be met. A review of policies and procedures of the primary bibliographic services indicates that the structure for effective bibliographic control is essentially in place. Ways to make records for existing master copies of film more generally available are being considered. Bibliographic reporting of current preservation work seems improved, but more timely distribution of such reports nationwide is needed.

- Preservation priorities need additional consideration.

The Committee considered the topic of preservation priorities but reached no specific conclusions, perhaps because there are so many items and categories of obvious importance. In the end, items to be replicated will be identified by subject and preservation specialists working in many libraries and archives. The goals and priorities of those individuals (and their institutions) must be known and subject to review by scholars, research faculty, and an informed public. It is anticipated that priorities will become apparent rather than being imposed. Many factors will be influential: copyright constraints, unit costs, present condition, anticipated demand, and personal interests. The key to success over time seems to be the thoughtful involvement in the selection process of a large number of informed individuals. There is much that will never be preserved, simply because time will run out. There is also much that is not worth the cost and effort of preservation. It seems probable that the matter of priority will be resolved by the evidence of action. It seems less important to assign ranks of importance from the top down than it is to put aside for now the items and categories that are unlikely to meet the test of time.

- Systematic and purposeful collaboration is essential.

The brittle books problem will not be solved by accident. The scale is too great, the cost too large, and the setting too complex. A joining of forces, not unlike that which has characterized the gradual development of a comprehensive and standardized bibliographic system, is needed. More than anything else, the projected cost of preservation demands program efficiency and credibility. Targets must be realistic, results visible, and benefits unquestioned. Even though the work will be done cooperatively, success in preservation will be dependent on the performance of each institution. Ideally, the program to preserve brittle books should improve the methods and enhance the principles of effective collaboration among libraries and research institutions, for while they are individually distinctive, they have a common cause.

ORGANIZATION

Meeting the conditions for success requires action on two fronts—establishing an organizational structure that will assist and support the libraries directly involved, and developing and promoting a funding plan.

In the final analysis, the work of preservation must be done by the individuals and institutions responsible for building and safeguarding the collections that, taken together, *are* our primary record. Meeting that responsibility is difficult because the present is always more demanding than the past. The accelerated deterioration of collections, only recently acknowledged, turns a difficult assignment into an impossible one under present circumstances. Unless new and extraordinary measures are devised and taken, the steady erosion of important collections, already begun, will quietly continue, and the possibility of accurately reconstructing important segments of public events and private accomplishments will slowly but inevitably decline.

Improving prospects for success will not come by shifting responsibility. Rather, enlisting new forms of help for those who are responsible is the most promising course of action. That help must be of a special kind: it must support without dominating; it must offer continuity of interest and participation; it must amplify skills and resources already at work and make present progress more visible; it must seek to strengthen existing capabilities and add new ones as needed; it must provide the sense of a common purpose that is essential to increasing financial support; and it must find ways to measure progress and promote efficiency. In short, a way must be found to add cohesion and force to existing efforts and aspirations.

To provide a structure that has these capabilities and, in addition, is able to adjust to changing needs and conditions, the Committee has encouraged the formation of two new bodies: a Commission on Preservation and Access and a National Advisory Council on Preservation, whose members will be designated by supporting organizations. The Commission, with appropriate staff support, must develop and carry out the plans and procedures that will enable libraries and preservation specialists to expand and integrate present preservation work. The Advisory Council is required to promote participation of all disciplines and to encourage support by involved and interested academic and professional organizations. It is also seen as an effective way to bring the interests and concerns of diverse groups into focus, thus providing general policy direction for the Commission itself.

The Commission on Preservation and Access

The success of the projected brittle books program rests with the Commission and its staff. The Commission will work on behalf of the libraries and organizations that must, in the end, do the work of preservation. Simultaneously, it must be an effective agent for all who will ultimately provide financial and intellectual support. In a sense, the Commission is seen as the matrix for this preservation activity, providing an ordered place for existing components and seeking to supply the elements required to fill the gaps.

The initial membership of the Commission will include some members from the original Committee and other individuals suggested by Committee members. Additional members may be enlisted by the Commission itself, which is expected to shape its own procedures, practices, and program, building on the conclusions of the founding Committee. For an initial period, the Council on Library Resources will provide a base for Commission operations. Funding for staff and Commission expenses for approximately three years will be required, after which time the Commission will be expected to have established financial and operating independence.

The Commission will be expected to:

1. Develop a funding plan for the preservation of brittle books and, with assistance from the Advisory Council, establish and develop a program to generate funds for use by participating libraries.
2. Establish the general conditions, policies, and procedures governing preservation work for the guidance of libraries, publishers, and other agencies interested in participating in the brittle books program.
3. Promote further development of a preservation information service by the Library of Congress and, especially, encourage the members of the Advisory Council to bring such information to the attention of their own organizations.
4. Encourage technical and other research on topics of importance to the brittle books program. Leadership of and cooperation among the national libraries and the National Archives seems especially critical in this area.
5. Establish a monitoring system to gather and analyze information about all aspects of preservation activity. Results of analytical work will help shape future methods and directions, will keep participants informed, and will be required in the preparation of reports to funding sources.
6. Monitor the performance of bibliographic systems to assure that information required to manage the preservation enterprise and to promote access to products is readily available.

7. Assure that access to preserved materials is efficient and supportive of research and scholarship. It is probable that existing practices and procedures will have to be modified as the quantity of available items increases.
8. Build and maintain effective communication with key organizations through the Advisory Council and promote participation in planning and operations by those institutions and individuals committed to the cause of preservation.

The National Advisory Council on Preservation

The Advisory Council should be affiliated with the Library of Congress. Its initial membership should include individuals designated by those library, archival, academic, and scholarly organizations with an interest in preservation. The Council, which is expected to set its own procedures and practices, may invite participation by additional organizations. The Advisory Council is intended to provide a link between organizations committed to preservation and the Preservation and Access Commission itself. The Council is expected to provide assistance to the Commission, and the Commission will make its work visible to supporting organizations through Council members.

The Advisory Council and its individual members will:

1. Inform members of their constituent organizations about preservation plans and operations.
2. Bring to the attention of the Commission the interests, concerns, and advice of their members.
3. Work in collaboration with the Commission to develop the procedures and activities required to support funding for preservation. The Council should seek to speak with one voice rather than many.
4. With guidance from the Commission, participate in long-range policy review.
5. Promote the objectives of preservation and conservation internationally.

FUNDING

The projected cost of addressing the brittle books problem over the next twenty years cannot be accommodated in the operating budgets of libraries. If an extraordinary preservation program is to be established and maintained, extraordinary funding will be required. The Preservation and Access Committee was not charged with raising funds for preservation, but it did conclude that raising the amounts required, over an appropriate period of time, was possible. The elements essential to success include:

1. Leadership, expressed by a substantial commitment of funds by key research universities and far-sighted government bodies.
2. Provision of carefully targeted funds by private foundations to assure initial progress in the essential areas—e.g., organizational continuity, installation of prototype programs, public information activities, incentive funding.
3. A public commitment to preservation that will serve to support federal and state funding of the brittle books program in increasing amounts.
4. Eventual participation by research universities and research organizations.
5. Provision for preservation of future acquisitions in the operating budgets of libraries, archives, and other organizations to help assure that the problem we now face will be contained in time.
6. Constructive involvement of the publishing community and library service organizations, especially the segments concerned with scholarly publications and the distribution of text on demand.

Future funding must be built on the base that now exists and that has grown in important ways during recent years. The level of funding needs to grow gradually and in phase with program development, reaching a stable, sustainable, and adequate level (approximately $15 million annually) in perhaps five years.

The measure of success will be in the response to questions such as these:

Will universities be willing to separate the matter of funding a national brittle books program from the process of setting annual library operating budgets?

Will library directors, many of them with pressing budget problems, support institutional participation?

Will private foundations continue and even expand their support of preservation?

Will the federal government and state governments join forces with others to support the brittle books program?

Will the great majority of research institutions take part even though their own libraries might not seem to have a preservation problem? (Given the goal of equitable access to preserved materials, there can be no free ride.)

Will all funding sources encourage libraries and archives to "play by the rules" that will be advanced by the Commission?

The Preservation and Access Committee has not tried to find answers to these questions. Thoughtful discussion has created a sense of optimism that this difficult task can be done—perhaps not perfectly, but responsibly. There is full agreement that now is the time to try.

Forum III: A Summary Report

Forum III was convened by the Committee on Preservation and Access. In addition to most members of the Committee, participants included representatives of organizations having an interest in preservation and several members of the new Commission on Preservation and Access that will continue the work of the Committee. Participants reviewed the work of the Committee, paying special attention to proposals for program management, funding, and the initial agenda of the Commission. The report of the Committee has been refined to incorporate certain recommendations of Forum III participants.

GENERAL OBSERVATIONS

The Preservation and Access Committee, during its own discussions, gradually developed a set of assumptions and principles that formed the foundation for its recommendations. Forum III underscored the importance of many of these items.

- Responsibility for preservation is inseparable from the work of building and maintaining research collections. Collaboration among libraries in assuring the availability of unmatched research resources, nationally, implies collaboration in their preservation as well.
- While preservation, per se, is a valid goal, it is the prospect of providing wider and more equitable access to a growing collection of preserved material that fully justifies the cost and effort.
- Although items in all categories of recorded information deteriorate with time, realistic priorities must be established. The brittle books problem, large though it is, is one that can be defined and addressed with reasonable precision.
- The preservation of archival materials is a coordinate matter that must be attended to. Unlike books published in editions of many copies, archival material is, by definition, unique, so the prospect for sharing responsibility among archives for preservation of essentially discrete collections is less promising than it is for libraries. But there are many aspects of preservation both enterprises have in common, including the technology for preservation (microfilm, optical disk, deacidification, etc.), the need for effective bibliographic control, the objective of equitable access, and the requirements for wider understanding of the need for preservation and for increased financial support.
- An absolute requirement for an expanding preservation program is the availability of bibliographic information pertinent to all aspects of preservation. This file of bibliographic and management information must be widely available and, ideally, it should be international in coverage.

A NATIONAL PROGRAM

Given the evidence of past progress and a realistic understanding of the nature of the work to be done, the participants agreed that this is the time to undertake a long-term, carefully planned effort to address the brittle book problem. The matter is one that will not go away and it is subject to a consistent and carefully designed program of action. Not to act will, in the final analysis, do irreparable harm to future generations.

The ultimate goal is to create an accessible national collection of preserved materials. It is not to reconstitute the present collection of every library. The manner in which the contents of brittle books are replicated and made available may greatly influence the future character of research libraries and the information services they provide. The projected preservation program brings with it an opportunity for libraries to refine their collection management policies, their operating methods, and the way they work together.

To accomplish the described work, the level of present production will have to be greatly increased and the work carefully coordinated to eliminate duplication of effort and to make the best possible use of available funds.

IMPLEMENTING THE PROGRAM

Forum III participants considered in detail the recommendations advanced in the report of the Committee for direction and management of the brittle books program.

The projected Commission on Preservation and Access was endorsed as an appropriate and potentially strong managerial body. The magnitude of the assignment was underscored and the participants urged that funding requirements for three to five years of work not be underestimated. The addition to the Commission of additional individuals with specific abilities (financial planning, for example) was encouraged.

There was agreement on the agenda of the Commission, as outlined in the report. Specific attention was given to items requiring prompt attention, including staffing, initial funding, the need to identify and begin specific projects to establish credibility, and the need for an imaginative and extensive communication program.

The effective involvement of the concerned organizations that are critical to success was a thoroughly discussed topic. The draft report proposal for a Board of Sponsors was judged to be imprecise, and use of the name National Advisory Council on Preservation was recommended. (This change and the implied refinements in the role of that Council have been incorporated in the report of the Committee.)

It was noted that each organization to be represented on the Council would have to find its own way for constructive participation, since the nature and interests of those organizations vary greatly. Additional organizations for Council membership were suggested, and the evolutionary nature of the composition and role of the Council was acknowledged. The need for routine and detailed communication from the Commission to Council representatives was stressed.

FUNDING AND INCENTIVES

There was agreement that the complete funding plan generally outlined in the report represented the only realistic approach. A long-term funding strategy will be required, and much Commission effort will have to be directed to developing financial support. Special attention will be required to describe in detail the incentives for institutional participation. The case for collaborative action by libraries and institutions that are financially committed to preservation is a strong one. Promoting financial participation by institutions with less of a commitment to preservation but with much to be gained over time through accessibility of preserved material will require specific attention.

These summary notes serve to confirm that Forum III participants made many useful suggestions and observations to the Committee. The detailed minutes of the meeting will be turned over to the Commission on Preservation and Access for use as the Commission begins its work. There was agreement that the chosen course is by and large the correct one. There was also a sense of impatience that work proceed without delay.

PARTICIPANTS IN FORUM III
WYE PLANTATION, MARCH 19-21, 1986

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APPENDIX 1

Committee on Preservation and Access Interim Report

Books printed on acidic paper and subjected to normal wear in library collections often show signs of irreversible deterioration in a few decades and eventually become useless. The paper in most books published, worldwide, for the past 125 years is acidic and the content of most of those books will become increasingly inaccessible unless their texts are reproduced. That task is the subject of this report.

Encouraged by library and academic organizations, the Council on Library Resources established the Committee on Preservation and Access during the fall of 1984. The members were asked to develop a realistic plan to preserve large quantities of library materials and to find ways to encourage action. The Committee has met three times thus far to consider the nature of the preservation problem, to assess present activity, and to determine needs and possible ways to meet them. Work has been concentrated on the specific matter of brittle books—those volumes that are already so deteriorated that their content soon must be copied or forever lost. There is an assumption that progress here will stimulate action on other categories of material as well.

This interim report from the Committee identifies the topics that have been, or soon will be, considered and sets forth conclusions reached to date. In the view of the members, success in dealing with the preservation problem will, in the end, be measured by the level and effectiveness of action by many individuals in many libraries. A "grand plan," if there ever is one, will probably be evident only in retrospect. Progress in preservation is made one book at a time. Many libraries, moving in concert, will, over time, do many books. "Moving in concert" is the heart of the problem and the focal point of the Committee's work.

The minutes of the three meetings of the full committee reflect the wide range of the discussions. Members have sought to learn more about the facts, conditions, and attitudes that will affect any expanded preservation program;

they have considered the results that might reasonably be expected; they have sought to identify the activities that must be undertaken to accomplish objectives; and they have considered matters related to production capabilities and program organization.

While the discussions continue, enough has been done to suggest several fundamental observations and conclusions.

1. Access

The Preservation and Access Committee began simply as the Preservation Committee, but it became apparent in the first discussion that access is the corollary of preservation. Any long-term preservation program will result in the creation of a "national collection" of preserved materials, i.e., a substantial and growing collection of master copies of items produced from deteriorated books selected for preservation because of their importance and available for replication for collections or personal use.

The cost of preserving a significant portion of those materials now unusable in research libraries will be justified only if access is enhanced. This implies effective bibliographic information about what has been preserved and a responsive system for securing copies of the texts themselves. The access system for a much expanded body of information may well become the prototype for new approaches to delivering library services with a bibliographic structure that, when appropriate, supports access as well as ownership.

2. Magnitude of the preservation problem

Studies conducted at the Library of Congress, the New York Public Library, Stanford University, and Yale University have shown that approximately one-fourth of these collections are at risk, i.e., so embrittled that they will soon become useless. Additional research at the Library of Congress indicates that substantial numbers of books move into the "at risk" category yearly.

Dean Robert Hayes of UCLA examined the data from these and other studies to determine the magnitude of the problem for the nation's research libraries. In ARL libraries alone, with collections numbering 305 million volumes, approximately 75 million volumes are currently at risk. By subtracting the preservation work already being done by Individual libraries and by factoring in such variables as overlap and numbers of materials moving into the "at risk" category each year, Dean Hayes estimated that in the next twenty years 3.3 million volumes of lasting importance must be converted to another form if their contents are to be saved.

The sheer quantity of work to be done is staggering, and the cost, estimated at nearly $400 million, inhibits action. The Committee is convinced, nonetheless, that the problem is tractable if it is broken into component parts and dealt with over time. Furthermore, beyond the practical considerations of how to proceed, the Committee's effort is based on the steadfast conclusion that preservation of the nation's intellectual heritage is essential and that research libraries have the obligation to carry out the work.

3. Collaborative effort

Knowing the dimensions of the problem leads to the conclusion that a collaborative effort is required. Many libraries are already engaged in preservation activities; many more understand the need. All libraries with a primary interest, regardless of network affiliations, must be involved. A national preservation strategy, if it is to be successful, must start with the premise that individual libraries are at the heart of the program. Thus, the strategy must set forth conditions and expectations in such a way that local decisions can be made in the context of a national plan. The strategy must not impede local decisions; rather, it should promote better-informed decisions.

It is only when a collaborative preservation program is accepted and acted on as a primary responsibility by research libraries and their universities that a "national collection" will become a reality. The collaborative nature of the work must extend to adherence to production and bibliographic standards and must include the creation of an access system for those items that are preserved. Only be joining forces can the job be accomplished. Institutions will benefit economically when they collaborate with others; each will serve its own ends at a reduced cost.

4. Technology

The Committee, first tempted by the promises of new technology, has concluded that, for the time being, preservation microfilming is the most reliable technique. A survey of the current state of video and optical disk technology applications in libraries suggested that it is too early to assume that disk technologies will solve the preservation problem, a conclusion that was further confirmed in the separate study of the magnitude and costs of preservation.

Every effort must be made to identify the most useful technology, to experiment where the prospects seem good, and to be prepared to take advantage of new and improved methods. Simultaneously, the microfilming process must be streamlined and costs reduced so that filming can go forward rapidly, even if it seems probable that alternative technology will replace microfilm before the present backlog of brittle books is copied.

5. Public understanding

Librarians have long been aware of preservation needs, but the magnitude of the problem is not generally understood by those who use and fund libraries. If the money required is to be forthcoming, faculty members, university administrators, boards of trustees, and government officials must be informed of the need and presented with carefully reasoned solutions.

Extraordinary means for capturing the attention of a wide and diverse audience must be found. Campus seminars, documentary films, and involvement of such organizations as the Advertising Council are but a few suggestions of the Preservation and Access Committee. Many other approaches need to be tested and used during the months and years ahead.

6. Systematic approach

The magnitude of the problem and the importance of the outcome suggest the need for a careful, systematic approach to preservation. The Committee seeks to present a comprehensive picture, not only of the ultimate plan, but also of the series of steps required to achieve the plan. Progress must be made and measured in stages.

If libraries have the will to do so, there are remarkable opportunities within preservation to experiment with new methods and new affiliations. In the final analysis, the ability to preserve deteriorated books and to make the copies widely accessible may serve as a kind of model for the "new" library that takes full advantage of technological possibilities.

CONTINUING ACTIVITIES

The Committee is scheduled to complete its work early in 1986. A final report will be issued at that time and, if present aspirations are realized, a way will have been found to encourage expansion and coordination of preservation activity in the context of generally accepted principles and objectives. To reach that goal, the Committee will give special attention to three types of activity.

1. Expanding the discussion

Members of the Committee, through their own work and their affiliations, reflect the concerns and interests of library, university, and public administrations; preservation specialists; and a variety of disciplines from the world of scholarship. Each member has, in her or his own way, described and amplified the work of the Committee to an extended audience. The publication and distribution of this Interim Report carries that process a further step, one meant to expand the opportunities for even more individuals and organizations to contribute to the undertaking.

Discussions projected for the next several months will encourage university trustees, state legislators, foundations, federal officials, and an increasing number of university librarians, faculty members, and academic administrative officers to consider ways in which they might advance the cause. The Committee is agreed that those who are concerned with preserving our intellectual heritage must speak with one voice if funding and participation are to reach required levels.

2. Additional fact finding and planning

Reports and analytical studies on several topics have been prepared for the Committee, but additional information is required. During the next few months, studies will be conducted for the Committee on several facets of the preservation issue.

- The process of setting preservation priorities

  Assuming that selectivity will be required, ways to identify categories of material for filming need to be devised and tested. Priorities need to be determined for each discipline or subject field, a strategy for applying those priorities needs to be developed, and a review process—one that involves the academic disciplines as well as library subject specialists—needs to be established. A small group of scholars and librarians will work with the Office of Scholarly Communication and Technology of the American Council of Learned Societies to explore these matters.

- The bibliographic record system

  There are two requirements for the preservation bibliographic system: it must provide information needed to "manage" preservation activity and it must identify and locate master copies of preserved items. Elements of the bibliographic structure needed to accomplish both objectives exist, but they are not universally available and the machine-readable records for existing masters are far from complete. If libraries are to integrate their preservation work, they must all have access to the same information concerning work under way or planned. If master copies of preserved text (the product of preservation work) are to be available to all who need them, the record must be complete and readily available.

  A careful analysis of the present situation, including determination of the number of records to be converted to machine-readable form and an exploration of prospects for bringing elements of the required system together into a cohesive whole, are under way by CLR staff. With constructive help from several organizations, it should be possible to develop the necessary bibliographic foundation for a national preservation program by the time the Committee completes its work.

- Access to preserved materials

Very early in its discussions, the Committee agreed that *access* to preserved materials was an issue no less important than preservation itself. The present, relatively low level of filming does not require much in the way of organization to obtain copies for use. The process is essentially that of interlibrary loan, with added delays for making the requested copy from the master. But a much expanded preservation program and a truly effective bibliographic system for identification and location may very well create new problems—increased fulfillment costs for libraries supplying copies from their masters and increased delays and procedural confusion for users.

The matter of access will be explored for the Committee during the next few months. A preliminary report will consider such questions as these:

a. How do librarians and users of libraries identify and locate master negatives?
b. How easy or difficult is it to obtain copies of microfilms, once located?
c. Is there a need for consolidation of distribution activities? If so, what approach would best serve users?
d. Are there existing bodies that might meet needs?
e. What economic issues need attention?

- The costs of preservation

The unit cost of preservation filming is high, which by itself forces selectivity. Even so, the sheer number of brittle books that should be copied is so large that every possible approach to reduce costs needs to be explored. The poor condition of many books and the need for page-by-page copying (no matter which technology is used) make the process labor intensive. Costs are a function of the number of steps and time required, from initial selection to final action. Some cost information exists and a study will be commissioned to review all aspects of the preservation process to learn whether and under what conditions savings can be achieved without introducing unacceptable reductions in quality.

With a careful assessment of present costs in hand, an economic analysis of the preservation system—including use of alternate technologies, evaluation of commercial operations, and cost implications of various organizational approaches—will be undertaken. Some preliminary work to gather together existing information is under way.

3. *Organization for preservation*

The organization and management of a much-expanded program of brittle books preservation is a topic that has permeated Committee discussions from the beginning but has been left unresolved until the end, simply because it is sensible to establish *what* needs to be done before considering how best to do it. There are already many libraries and organizations at work on one aspect or another of the preservation "problem." Acknowledging present activity and recognizing that, ultimately, the volume of work must increase greatly, the question becomes one of what needs to be done that is not now being done and cannot be accomplished with existing operating bodies.

The discussion is not nearly over, but at least four specific matters seem to need additional attention.

- Funding a preservation program over a ten-year (or even twenty-year) period will require concentrated attention and persistence. Government, private foundations, and institutions will all have to take part in providing the funds for the libraries and organizations that will do the work in the context of national objectives and accepted procedures. Something more in the way of effort and organization is needed to promote funding at the required levels.
- Despite much activity in many different settings, there is as yet little sense of a "national program." With only a few exceptions, goals are largely institutional. A way must be found to establish a credible national setting for preservation activities, one that will enable individual libraries to coordinate their own work with that going on elsewhere. The need for a national "backdrop" for preservation work will grow with the volume of activity.
- It is probable that, despite the growing number of libraries and organizations now involved in at least some aspects of preservation, there are still important matters not being addressed. Development of a more effective approach to providing access to materials or an expanded research effort are examples. There is a need to assure that essential operating components are brought into being as they are needed.
- An essential element in a program of the magnitude being projected is the capacity to monitor results. Cost control, production levels, and availability of the final product must all be watched to assure that results match promises to funders. As important is the critical assessment of procedures and results by the scholarly community, administrators of universities, and government leaders. A constructive approach to judg-

ing progress must be found to satisfy obligations to funding sources and participants alike.

These elements of an agenda are generally accepted. Further, there is a conviction that a sophisticated system for providing information about preservation processes and activity for use by all who are concerned is required. The expanding efforts of the Library of Congress in this area are of great importance.

The Preservation and Access Committee will finish its work by assessing organizational requirements and proposing a way to meet them. For all the reasons noted in this Interim Report and from the point of view of responsible management, a collaborative effort is essential. The question being considered is "What is the form and what are the characteristics of the organization most likely to assure a successful preservation program?"

Models for solving the organizational and operational problems inherent in national undertakings range from those that simply "advise and assist" on the one extreme to those assigned full operating responsibility for extensive programs on the other. This, like most other topics related to fundamental social and educational issues, must be dealt with in a setting of differing priorities and concerns, a long and important tradition of institutional autonomy, and complex economic factors.

In the final analysis, any successful organization must deal effectively with the need to shape and maintain consensus on key matters, to stimulate necessary funding, and to assess and even insist on progress toward accepted goals. The organization — more accurately, its individual members — must have the political acumen required to build and sustain the support of each constituency: university administrators, faculty, librarians, the appropriate commercial sectors, and government. The final report of the Committee will reflect the judgment of its members on this fundamental matter.

APPENDIX 2

Committee on Preservation and Access Background Studies

The Preservation and Access Committee considered many issues during the course of its work, some of which stimulated preparation of discussion briefs or research reports. While none of the papers produced for the Committee is available, this record will give some indication of topics that were discussed.

Book Longevity: Reports of the Committee on Production Guidelines for Book Longevity. Washington, D.C., Council on Library Resources, 1982.

These reports were important sources of information for the Preservation and Access Committee as it began its deliberations. The *Report on Book Paper* contains recommendations related to production and use of acid-free paper, and it includes technical information that characterizes permanent papers. *On Longevity in Book Binding* concerns binding durability, longevity, usability, and repairability.

Analysis of the Magnitude, Costs, and Benefits of the Preservation of Research Library Books

This report characterizes the variables of the problem with respect to magnitudes, costs, and benefits; assembles the available data into a coherent summary in the context of those variables; provides estimates and assumed values for relevant parameters based on the data; identifies the gaps and weaknesses in the available data and the means by which they may be corrected; and proposes research activities needed to effect those corrections.

The study is currently being refined through on-site data collection at selected ARL libraries. The data will be used to study overlap among collections, costs of processing, and projected benefits. The findings will help make the parameters of the preservation problem more reliable, consistent, and precise and will be important for long-term planning and funding for preservation.

Scholars and the Preservation Problem

This examination of scholars' concerns relating to the preservation of library materials focuses on what is at stake, the potential for participation by scholars in a national program, and behavioral issues.

Selection and Appraisal for Preservation

General procedures for the selection and appraisal of materials to be preserved in their original and secondary formats are considered.

Legal and Proprietary Concerns

Ownership, proprietary rights, and compensation issues that will affect both the private sector and the scholarly community are presented.

Saving Books: The Acid Test of a Civilization

This paper suggests initiatives that might be taken to develop national awareness of the paper deterioration problem and its potential solution. Recommendations are given for mounting a national educational campaign; enlisting the help of university administrators, scholars, librarians, archivists, government officials, and legislators; building a national network of vocal supporters; developing funding sources; and lobbying.

Organization and Management of the Brittle Books Program

Five primary topics that must be considered in shaping an appropriate management approach to an extensive preservation program for brittle books are identified. They are: 1) facts, conditions, and attitudes that will shape the initial program, 2) required results of the program, 3) activities that must be undertaken to accomplish goals, 4) identification of agents and participants, and 5) communication links required to transform independent activities into an operating system.

The Management of Preservation Information

Preservation programs, local and national, require information management systems linking preservation data to related bibliographic data to provide a record of those items that have been preserved, items to be preserved in the future, and treatment method used or anticipated. This paper presents current national reporting efforts and requirements for a national preservation information system.

Physical Access to Microform Masters of Preserved Materials

Six librarians were commissioned to write papers on the issue of physical access to microfilm masters. On the assumption that an accelerated program of preservation microfilming would result in a large increase in microform masters and copies, they describe their views of the most pressing problems related to access and suggest possible ways of addressing them.

Access to Microform Masters of Preserved Titles: The Bibliographic Record

This paper summarizes the findings of a poll of the bibliographic utilities and the Library of Congress to determine what, if anything, should be done to assure bibliographic access to microfilm masters of preserved titles. It was concluded that the elements appear to be in place for a logical, consistent file of bibliographic records representing the microform masters held in this country and abroad.

The Role of Scholars in the Preservation of Library Resources: Report of the Subcommittee to the Preservation and Access Committee

The report summarizes a meeting of scholars, librarians, preservation specialists, and administrators to discuss how scholars might best contribute to a preservation program through their involvement in setting priorities for selecting materials to be preserved. Two models for selection are presented.

Preservation and Access: Assuring Future Progress

The subject of this paper is the organizational structure required to maintain continuity of effort for preservation. A proposal for a new Commission on Preservation and Access is outlined along with an initial agenda of activities.

Study of Preservation Microfilming Costs

This project, currently in progress, involves a study of preservation microfilming costs at four libraries, which were chosen on the basis of their different approaches to filming. Attention will be given to cost determination and job design — including work flow, forms design, and shop layout — to identify factors adding unnecessarily to the cost. Problems of quality control and economy will also be taken into consideration.

WHAT AN INSTITUTION CAN DO TO
SURVEY ITS CONSERVATION NEEDS

It has been our experience at the Northeast Document Conservation Center (NEDCC) that few libraries have a comprehensive preservation policy or conservation program. Every library should have such a policy and a long-range program in order to prolong the useful life of the collections and get the greatest return for scarce preservation dollars.

It is not necessary to tell you about the general condition of books in libraries resulting from the abuse they receive. It is sufficient to reiterate what Frazer Poole at the Library of Congress reported in 1973 that "over one-third of the books in that great institution are too brittle to use." At that time, Poole also predicted that "most non-fiction published from 1900-1939 would be unusable by the year 2000." I think that his most significant observation at a later date was that if the Library of Congress kept only 10% of the present six million brittle books (in 1973) and took care of them at the rate of 20,000 a year, it would take thirty years and eighteen million dollars to do the job. In your libraries, regardless of size, the same general situation exists. Do we need any further convincing that this situation can no longer be ignored?

What then can be done to determine the conservation needs in a library in order to establish a conservation policy and program? Those of you who are familiar with the work at NEDCC know that we consider conservation in two categories: (1) prevention and (2) restoration. I believe that it is only natural to examine the situation in libraries similarly: (1) what is happening to the collections and what can be done to prevent further damage, and (2) what are the repair and restoration requirements for materials already damaged, what can be done "in-house," and what must be done by professionals.

The NEDCC staff does conservation surveys for libraries to evaluate buildings for their suitability as repositories for books, and to examine the collections in the buildings. NEDCC survey reports describe the existing problems in the libraries based on evaluation and examination; draw conclusions from the same; recommend necessary treatment (in-house and professional); suggest priorities; and estimate the costs for preventive and restorative treatment proposed. This report then becomes a planning document that among other things can be used to support requests for grant assistance.

If a library staff prefers to do its own survey or, because of unavailability of funds, must do it themselves, these are the questions for which they must find answers. The information gathered by even an inexperienced surveyor will be enlightening:

I. The Building

A. Characteristics of the building (new construction is not always better)

(1) construction materials
(2) condition of roof and walls. Do they leak? Does water accumulate on roof? Are walls and roof insulated?
(3) condition of attic, basement and storerooms
    (a) are they clean or cluttered and dirty?
    (b) is cellar dry or wet?
    (c) evidence of rodents, insects, mold?

II. The Environment in the Building

A. Are there provisions to maintain constant temperature and humidity throughout the library 24 hours a day, 365 days a year? If so, what is the temperature and what is the humidity?

B. What machinery is available for control of temperature and humidity?

C. If building is air conditioned does machinery include humidifiers and dehumidifiers? Are they working properly?

D. If there are no provisions for year round, positive close control of temperature and humidity, what are the prevailing conditions: (1) in the summer months, (2) during the heating season and (3) during the transition periods in the spring and fall?

E. How is sunlight entering the building controlled to minimize intensity and remove ultra-violet radiation associated with sunlight?

F. What type of artificial illumination is in use? What is the illumination factor (500 lux is optimum from the point of view of conservation)?

If fluorescent lights are in use, are they screened to filter out the ultra-violet energy radiated by fluorescent tubes?

G. Is there a program and procedure for monitoring the environment on a regular basis?

III. Building Security

A. What kind of intruder alarm is installed? Is it connected to local police station or campus security office?

B. What type of fire alarm is installed, and is it connected to local fire headquarters?

C. What is the fire quenching system?
   (1) sprinkler
   (2) halogenated system

D. Number and type of portable fire extinguishers.

E. Are heating furnaces within the building or elsewhere?

F. Is heat transmitted by hot water, steam, or hot air?

G. What is the age and condition of the heating system and the heat transferring equipment?

IV. The Stacks and Other Library Rooms

A. What is the average temperature and humidity in each? How are they maintained?

B. Housekeeping situation - clean? dirty? cluttered?

C. Evidence of insects, mold or rodents?

D. Location of steam and hot water pipes relative to stacks and cases?

E. Type of artificial illumination - If fluorescent, is it UV screened?

F. Condition of electric wiring?

G. Evidence of building leaks on the walls and ceiling?

H. Number, type and size of windows; what direction do they face? Do they have provisions for UV control and reduction of intensity of daylight?

I. Evidence of light damage on spines of books?

J. Evidence of previous water damage, particularly in the basement and attic areas?

K. Type of book stacks - Are they adequate for oversize volumes? Is there good air circulation around them?

L. Is there a well planned and supervised housekeeping program? Who does the work? Who supervises it and checks the results?

V. The Collections

A. The general appearance of each collection or category of materials.
   (1) evidence of wear and tear, soil and surface dirt, water stains.

(2) evidence of acid damage - if so, to what degree?
(3) evidence of fungus growth, insect damage or damage by rodents.
(4) evidence of photo chemical damage (faded spines, discolored paper, etc.)

VI. Quality Control

A. Does aquisitions staff know the difference between permanent/durable books and others; publishers' binding vs. library binding, etc.?

Are they allowed to use these criteria in their purchases?

B. Is there a system for controlling the quality of materials ordered by or for other departments?

C. Is it possible for library staff to evaluate materials offered to them by salespersons?

VIII. Disaster Vulnerability

A. Does library have a disaster plan? A disaster preparedness committee?

B. What would library staff do if warned of an impending flood, windstorm, or fire on the premises?

C. What are provisions for coping with vandalism?

D. Are library shelflists and duplicate card catalogs kept elsewhere than in the building?

The foregoing are suggestions for evaluating the condition of a library building and its contents to determine where you stand. When the answers to those questions have been accummulated it should be obvious where there are potential sources for trouble. Corrective action needed should also be apparent; if not, seek the advice of a professional conservator to help you arrive at the right decisions to eliminate or minimize the effects of unstable temperature and humidity, dangerous lighting conditions, unsatisfactory housekeeping and building maintenance.

After necessary preventive measures have been taken, these are my recommendations for identifying and taking action on the repair and restoration requirements for a library's collections. The following is based on these assumptions:

(a) certain repairs can and should be done "in-house".
(b) other categories of repair and restoration must only be done by professional conservators or bookbinders.

(c) "in-house" treatment includes simple book cover repairs; cleaning of books and other materials with erasers, ground art gum, etc., aqueous and non-aqueous deacidification of black and white materials only; simple page repairs of books; simple repairs and/or polyester film encapsulation for documentary materials, broadsides, posters, etc.
(d) all else should be done by professional bookbinders, conservators or conservation technicians working under the direction of a conservator.

With this in mind, is there someone in the library charged with deciding which materials shall be treated in-house and which must be sent out for treatment?

Is there some one in the library who decides which books are valuable as objects as well as content and which are important only for their intellectual content?

Is there anyone in the library who can recognize and identify acid deterioration, photo-chemical degradation, water damage vs. moisture damage resulting from high humidity (and condensation therefrom), the effects of fluctuations in heat and humidity on paper, various types of insect damage, damage by rodents, and mildew damage in its early stages as well as advanced fungus growth?

If so, is that person qualified to determine whether the material should be replaced or repaired, copied on microform or hard copy, or discarded? If the decision is to repair an item, can that person then decide whether various materials need cleaning only, rebinding only, or paper stabilization plus other paper treatment?

If the library is fortunate to have someone who is well informed about the nature of library materials and the effects which the environment has on them, is there a well established procedure for periodic examination on a regular basis of all of the materials in the library? Are there provisions to bring to the attention of this "conservation coordinator" reports of damage by patrons or by staff personnel who become aware of damaged materials during the course of their other library responsibilities?

Is there an isolation area for damaged books requiring rebinding only and for "brittle books" in need of major restoration?

Is there a procedure for periodic screening of the books in the isolation area based on:

(a) relation of each damaged book to the entire collection?
(b) the research importance or historical importance of the volume?
(c) importance based on frequency of use?
(d) permanent vs. temporary importance of each?

Is there a budget for replacement of books? If so, what proportion of the budget is for reprints, microforms or hard copying, out of print sources?

How extensively does the library rely on microfilm? Is there a library policy for microfilm?

Does the library have an "in-house" repair capability - how is it staffed - how is that staff trained - what are they required to do - what are they told not to attempt - what workshop space and tools and equipment are available to them - what is expected from them in the way of "production" - what is the average cost per repair in that facility?

Does the library have a binding coordinator - does that person know the difference between publishers'bindings and library bindings on new books - does that person know the difference between commercial rebinding and library rebinding - the difference between library binding, conservation binding and restoration binding?

Does the binding coordinator know the requirements for a "good" library binding (even though there is dissension in the library profession in regard to standards)?

Does the library have a rebinding preparation policy to keep down costs and a binding instruction form to accompany each book to tell the binder what the library wants in the way of quality of materials and workmanship as well as other binding instructions?

It must be remembered that the effectiveness of library conservation measures depends to a great extent on the attitude of the library administrators and trustees based on their overall awareness of conservation. Are the senior staff and trustees committed to conservation of the whole library, or of the rare books and special collections only? Is conservation education made available to the entire staff or is it reserved for one reason or another for a select few?

Do the library senior staff and trustees have long range goals for conservation and a determination to achieve them? If so, have they formulated a policy to accomplish those goals including adequate budgeting for conservation?

Has the library director appointed a conservation committee and given them specific charges - and a librarian/conservator also with specific instructions? If so, to whom does the committee and the librarian/conservator report? What authority has been delegated to them in the everyday management of the library?

Does the librarian/conservator and/or the conservation committee keep in touch with local, state, regional and national conservation facilities?

Conservation management is not easy nor is it inexpensive. However, if librarians do not recognize their responsibilities in this area as they do in other aspects of their work, many of the records of our heritage entrusted to their care will be damaged beyond salvage in the not too distant future.

Progress in library conservation can only be made when professional librarians "take charge" - they can pass the buck to no one else. Help is available to librarians from:

A. The Library of Congress
B. The Northeast Document Conservation Center
C. The American Institute for Conservation
D. The Library Binding Institute
E. RTSD Committee on Preservation of the American Library Association
F. RTSS of the New York Library Association (Conservation Committee)
G. The Preservation Methods Committee of the Society of American Archivists
H. American Association for State and Local History
I. Professional conservators and bookbinders

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From Problems Perceived to Programs in Practice: The Preservation of Library Resources in the U.S.A., 1956–1980

Pamela W. Darling and Sherelyn Ogden

Twenty-five years ago preservation was largely a neglected area. This historical review focuses on major events, activities, and publications that have contributed to the emergence of preservation as a vital specialty within librarianship.

IN 1946 PELHAM BARR WROTE, "Silence, rarely broken, seems to surround the subject of book conservation. . . . Conservation, as responsible custody, is the only library function which should be continuously at work twenty-four hours a day . . . concerned with every piece of material in the library from the moment the selector becomes aware of its existence to the day it is discarded. The reason this sounds so exaggerated is that it is a forgotten platitude. . . . There was a time when library administration was simpler, when these platitudes were living, activating principles. But, with the increasing complexity of universities and their libraries, the custodial function of the library—the 'care and custody of the collection'—has deteriorated through neglect. . . . It became harder and harder to develop a program and procedures for book conservation, and therefore it was more and more neglected."[1]

Barr's experience as a founding member and first executive director of the Library Binding Institute brought him into close contact with the results of this neglect, and his analysis of the causes and outline of administrative remedies are astute and still remarkably valid. But he was ahead of his time, and the silence about conservation deepened in the following decade.

What then of the quarter-century to be reviewed in this paper? How has conservation, or preservation, fared? (The reader will here note

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that the terms *conservation* and *preservation* are used interchangeably. Despite numerous efforts to define and distinguish between them, no working consensus has yet emerged within the library profession, and rather than attempt to impose our own versions—the authors don't altogether agree either!—we shall flow fuzzily with the crowd on this point.) Since Barr's time, the silence about conservation has ended. These twenty-five years just past have been increasingly noisy. Indeed, at the risk of irritating proper historians, we shall here suggest that the modern field of library preservation was born in 1956, for two events occurred in that year that can be considered the beginning of our profession's serious and sustained attention to preservation.

FIRST STEPS

The first of these events was the publication in January 1956 of a *Library Trends* issue entitled "Conservation of Library Materials."[2] Edited by the late Maurice F. Tauber, the issue included articles on the conservation of old and rare books, stack problems, lamination, binding, discarding, and personnel for preservation functions. Tauber's introduction to the issue was titled "Conservation Comes of Age," a premature assertion as we can now see, but the infant was definitely alive and growing.

Tauber had reported that committees of the Association of Research Libraries (ARL) and the Council of National Library Associations had considered plans for the protection and preservation of library materials in 1954 and 1955, apparently motivated chiefly by wartime and cold war fears of military attack and the threat of nuclear devastation. The seeds of several "national plans" can be found in these deliberations. Although these seeds have germinated (if not flourished) in the years since, in 1956 many critical ingredients were still missing. As Tauber's introduction concluded: "The reader may not find in these pages as many guideposts for a conservation theory as he might like . . . the major usefulness of the papers, however, is in pointing up the many areas which are still in need of basic investigations."[3]

Who was to carry out these investigations? A potent new force, for preservation as for most other areas of librarianship, emerged through the other major event of 1956, the establishment of the Council on Library Resources (CLR). Funded by the Ford Foundation and guided through its first fifteen years by the extraordinary Verner W. Clapp, CLR from the start recognized preservation as an urgent problem and set in motion the "basic investigations" necessary for its solution. A full history of the Council's role in preservation is well beyond the scope of this review, but the Council's significance as a guiding hand will appear throughout the account that follows.

Repeatedly associated with the names of Clapp and the Council during these early years is that of William J. Barrow. A document restorer at the Virginia State Library, Barrow became fascinated by the problems of aging paper. In the late 1930s he developed the cellulose acetate and tissue method of lamination that bears his name, and, in the mid-1940s, the first of his deacidification processes. His work first became known to the larger library community through the 1956 *Library Trends* issue.[4] Perhaps sensing that the time was now ripe, the Virginia state librarian, Randolph W. Church, approached CLR with a proposal that Barrow be supported in an extensive study of the "paper problem." Clapp agreed, and on June 1, 1957, Barrow began his first study on the physical strength of the paper used for nonfiction book publishing between 1900 and 1949. The shocking results, suggesting that only 3 percent of the volumes studied had paper which could be expected to last more than fifty years, led to a second study on the stabilization of modern book papers. A report of these two studies appeared in 1959,[5] and in March of that year, again with CLR support, Barrow began a year-long investigation of the feasibility of manufacturing durable paper.

That same year, CLR provided support to the American Library Association (ALA) for the establishment of the Library Technology Project (LTP), brainchild of Clapp and CLR vice-president Ruggles. LTP came into being with Frazer G. Poole as director, and although LTP's activities have by no means been confined to preservation, its role and Poole's were nonetheless significant, as we shall see.

Following publication of the report for Barrow's second Council-funded project on the manufacture of stable paper,[6] a one-day conference was held on September 16, 1960, "to explore the potential benefits for the users of books offered by the new chemical wood pulp paper recently developed under the auspices of the Virginia State Library by W. J. Barrow. . . ."[7] Cosponsored by the Virginia State Library and ALA, the meeting in Washington's Cosmos Club brought together a group of librarians, publishers, paper manufacturers, and CLR staff for a general review of the situation and of the effects Barrow's findings might be expected to have on future publishing. The final recommendation was that ALA establish a committee to "continue some discussion of this problem, looking toward mutually agreeable solutions."[8]

Two other events of 1960 moved forward the cause of preservation—one directly, and the other indirectly but, in the long run, as significantly. In June 1960, after a discussion of Barrow's findings at a meeting of the Association of Research Libraries, a standing Committee on Preservation of Research Library Materials was appointed.[9] Since the formation of the committee led in the next twelve years to the articulation of a broad-scale cooperative approach to the nation's preservation problems, this action was evidence of the trend Tauber had earlier identified—"that a problem of national significance is receiving earnest attention from library leaders."[10]

The other event, virtually unnoticed within the library world, was the formal recognition of the profession of art conservation in the United States by the establishment of the American Group of the International Institute for Conservation of Historic and Artistic Works, and by the admission of the first class to the country's first graduate training program for art conservators at the Institute of Fine Arts of

New York University. The development of professional educational programs in this area, with its obvious parallels and areas of overlap with library preservation, is now strongly influencing the pattern of professional development for the latter. And it is worth noting that the first graduate of NYU's program, art-on-paper conservator Mary Todd Glaser, became senior conservator of the New England Document Conservation Center, the first cooperative regional center with a special focus on library materials. But we are getting ahead of our story.

In 1961 the search for answers to technical problems was accelerated when CLR funded the W. J. Barrow Research Laboratory, a permanent facility located in the new Virginia Historical Society building. Here Barrow and a small staff of scientists pursued investigations on permanence and durability of the book.[11]

EARLY NATIONAL PLANNING

In 1962 the first published report from the ARL preservation committee sought to establish, through a CLR-funded sampling study, a framework for national planning by assessing the "magnitude of the paper-deterioration problem."[12] The findings—that nonserial titles listed in the National Union Catalog in 1961 contained just under three billion pages, of which nearly 60 percent were probably printed on paper that was rapidly deteriorating—were perhaps more stunning than stimulating to specific action. But by the end of the year CLR had provided new funds for a major project to determine potential solutions to the paper-deterioration problem.

This study was conducted by Gordon Williams, director of the Center for Research Libraries. His report, *The Preservation of Deteriorating Books: An Examination of the Problem with Recommendations for a Solution*,[13] was unanimously adopted by ARL in January 1965 and has been called "the most significant single document on the subject."[14] Williams concluded that the best way to deal with the problem of the deterioration of library materials would be to establish a centralized federal agency to preserve a physical copy of every significant written record and make copies available to all libraries. Microfilming of materials as an adjunct to physical preservation, to preserve the text and reduce wear on the original, was also an important element of the proposal, and Williams commended the Library of Congress' work toward a central listing of microform masters. The first issue of the *National Register of Microform Masters* appeared in September 1965[15] and has since become an essential tool in all preservation microfilming activities.

At its June 1965 meeting, ARL recommended that the Library of Congress take responsibility for implementing a program based on the Williams report, and LC accepted the challenge.[16] At a meeting on December 6, 1965, among senior staff at the Library of Congress and the ARL Preservation Committee, the Librarian of Congress "stated that the Library of Congress will assume responsibility for a national program for the preservation of deteriorating books in accordance with the principles set forth in the Report . . . by Gordon R. Williams."[17]

Seeing a need to discover in practice the administrative and technical problems that would be involved in formation of a national preservation collection, the ARL committee next sought and received from the Council a grant to finance the Pilot Preservation Project at the Library of Congress. Norman Shaffer was named to direct the project, and it appeared that a national program had truly been set in motion.

BASIC INVESTIGATIONS

Meanwhile, the Library Technology Project had been at work on a variety of projects related to preservation—studying adhesives and pressure-sensitive tapes; developing the Se-Lin system for safe, durable call number labels; undertaking an extended project with the Barrow Laboratory for the development of performance standards for library binding; sponsoring Hawken's work on reprographic techniques, including his landmark *Copying Methods Manual*;[18] supporting Barrow's work on permanent/durable catalog cards. In 1965 a special CLR grant supported an LTP project intended to produce a series of manuals on conservation practices. In fact, LTP engaged in a whole range of projects relating to the physical quality of library materials and methods.[19]

In a related development, the first report on Richard D. Smith's experiments in search of a deacidification treatment for whole books appeared in 1966.[20] Thus during this period the Library Technology Project and the Barrow Research Laboratory, supported by the Council and often working together, and Smith (soon to be supported by CLR), were carrying out "basic investigations" and developing technical tools for building library preservation programs, while the deliberations and projects of ARL and LC, also Council-supported, were setting up the policy framework for those programs. Much had occurred in the ten years since the *Library Trends* issue on conservation.

LOCAL DEVELOPMENTS—THE NEWBERRY EXAMPLE

To what extent was all this activity affecting operations on the local level? Librarians have been caring for materials, in some fashion, since libraries began, but the intensity and effectiveness of the care has varied considerably. Although binding and mending sections and stack maintenance units have been common for generations, and the microfilming of deteriorating materials to preserve their intellectual content began in the early 1930s,[21] programs encompassing the full range of preservation activities as we now define them are of very recent origin. For most libraries in the fifties and sixties, a wide range of problems was arrayed under the rubric of *preservation* or *conservation*. Many of the technical solutions to these problems were still experimental and problematic at best. Further, the organizational complexities implicit in any attempt to assign responsibility for programs addressing all these problems to a single administrative unit prevented the development of a unified program.

One institution particularly suited to the task of developing a program through the happy coincidence of place and personality quietly moved ahead during the first decade of our review. The Newberry Library, private and scholarly, is free of heavy patron pressures from faculty and student body, Congress, or a taxpaying citizenry, and has a specialized collection interest in the history of the book. One Newberry board president, Everett D. Graff, brought a special concern for preservation to his duties, and by 1961 air conditioning was installed in the dignified old Chicago building to retard deterioration of its contents. The next year, Lawrence W. Towner was appointed librarian and began working to extend Graff's concern to the total care of the collections. In 1964 Towner appointed Paul N. Banks as the Newberry's first "conservator," giving him broad responsibilities for reshaping the in-house bindery operations and developing a library-wide conservation program.[22] With scientific research and the resulting technical tools, broad national policies backed up by a steady flow of funds through CLR, and the development of local procedures for adaptation elsewhere, the stage seemed set. Surely development of preservation as a discipline within librarianship would be rapid from then on.

THE FLORENCE INTERLUDE

Nature has a way of interfering in the affairs of humankind, however, and on the night of November 4, 1966, the waters of the Arno swirled through Florence, Italy, leaving a trail of mud and destruction throughout homes, businesses, churches, museums—and libraries. Conservation activities in the rest of the world virtually came to a halt as binders, restorers, and conservators joined a massive international salvage effort. Much has been written about Florence, the salvage operation, and its effects on the conservation field which we shall not repeat here.[23] It is appropriate for this review, however, to observe that although the Florence "event" temporarily interrupted developments in the United States, both the focusing of public attention on the subject of conservation and the techniques and professional relationships established through the salvage effort stimulated and influenced subsequent activities here to an extraordinary degree.

This is not to say that nothing else happened while the mud was being cleaned up in Florence. In May of 1967 the American Group of the International Institute for Conservation of Historic and Artistic Works adopted the first code of ethics for art conservators, a companion document to its 1963 standards of practice, the latter of which is often referred to as the "Murray Pease Report" after the chairman of the committee that prepared it.[24] In June the Library of Congress appointed Frazer G. Poole as LC's first preservation officer, and he began a long series of reorganizations and expansions of LC's preservation activities. In the fall of that year, LTP published the first edition of Carolyn Horton's now classic *Cleaning and Preserving Bindings and Related Materials*;[25] the New York Library Association held a symposium on preservation during its annual conference; and the first edition of the Cunha work, *Conservation of Library Materials*, appeared.[26]

The Pilot Preservation Project (which became known as the Brittle Books Project) was conducted at the Library of Congress during this period. This study concluded that establishment of a national preservation collection was administratively feasible in terms of identification of material, that compilation of a register of best copies would present few difficulties, and that problems still to be resolved included development of a more efficient and economical method of deacidification, determination of optimal storage conditions, and choice of a secure site.[27]

By 1969, most everybody was back from Florence and the pace began to increase. A second edition of Horton's manual, revised and expanded and in great demand, appeared from LTP. The New York Library Association established an ad hoc committee on preservation. Binder-restorer Laura Young was commissioned to do a preservation survey for the library of the New York Botanical Garden, and in August a conference was held at the University of Chicago.

THE CHICAGO CONFERENCE AND SUBSEQUENT DEVELOPMENTS

The Thirty-fourth Annual Conference of the Graduate Library School, a three-day event entitled "Deterioration and Preservation of Library Materials," included formal papers and discussions covering the scholarly needs for preservation, the nature of library materials, and the physical requirements for insuring their survival, organizational considerations, and personnel needs. The conference organizers "hoped that the wide representation here of various parties concerned with the problems of preservation may contribute to a wider communication of knowledge and cross-fertilization of ideas so important in scientific advance."[28] They succeeded in their aims, for the conference served to summarize what was then the state of the art and to stimulate renewed activity, while the proceedings remain one of the most frequently cited documents of the field.

In the next year, Poole's labors at the Library of Congress began to bear fruit, as CLR provided funds to establish a laboratory, and Peter Waters—a major organizer of salvage operations at the Biblioteca Nazionale Centrale di Firenze and prominent English binder-restorer—was brought in as consultant to guide the laboratory development. Also under Poole's leadership, the Bookbinding Committee of ALA's Resources and Technical Services Division expanded its functions and changed its name to the Committee on Preservation of Library Materials. At the Newberry Library, Banks' operation was expanded through the establishment of a conservation laboratory. The New York Public Library, actively concerned about preservation since at least the days of Lydenberg, moved closer toward a formal program with the publication of Henderson's *Memorandum on Conservation of the Collections*,[29] an amplification of the paper he and Robert Krupp had prepared for the Chicago conference.

Attention was also focusing again on the need for a national program. The LC Pilot Preservation Project had pointed up the wide array of technical and organizational questions surrounding the "national collection" idea, and the ARL Preservation Committee pressed forward the effort to answer those questions. With a grant, this time from the U.S. Office of Education (the first significant federal funding for library preservation), the ARL committee, under the chairmanship of Warren J. Haas, launched a new effort that culminated in the publication of *Preparation of Detailed Specifications for a National System for the Preservation of Library Materials*. Originally the project was aimed at establishing the operational details necessary for implementation of the Williams proposals of 1964, but as work progressed the purpose was modified. Noting that "the objective . . . of suggesting specific steps that seem necessary to help move the research library community towards the preservation goals it has set for itself remains unchanged,"[30] the Haas report takes the Williams report as its starting point but moves considerably beyond it in making recommendations for future action.

While the Haas report was still in preparation, important steps were being taken. Waters was appointed restoration officer of the Library of Congress. Yale University Library began a Preservation Office, first under Susan Swartzburg, who was succeeded by Gay Walker; the New York Public Library established its Conservation Division under John P. Baker; the Boston Athenaeum sponsored a major conference on library and archives conservation;[31] Jean Gunner was appointed conservator/bookbinder at the Hunt Botanical Institute Library; and Paul Banks began teaching conservation of library materials for the University of Illinois.

Information was becoming much more available. The second edition of *Conservation of Library Materials* appeared; Clapp produced his remarkable "Story of Permanent/Durable Book Paper, 1115–1970";[32] LTP brought out the second volume in its conservation series, Middleton's *Restoration of Leather Bindings*;[33] LC published the first edition of Peter Waters' pamphlet on salvaging water-damaged materials;[34] the Library Binding Institute published Tauber's *Library Binding Manual*;[35] and a major treatment of deterioration, by Carl J. Wessel, appeared in the new *Encyclopedia of Library and Information Science*.[36]

As techniques for physical treatment expanded and improved, the professional structure grew. The American Group of the International Institute for Conservation of Historic and Artistic Works reorganized as the American Institute for the Conservation of Historic and Artistic Works (AIC). This small but vigorous group, including conservators of library materials, grew dramatically in the following years, stimulating the development of improved techniques, educational programs, and an increasingly scientific approach to vexing technical problems.

THE SEVENTIES

It is relatively easy to discern the patterns and trace the trends within events of a decade or more ago. Analyzing the more immediate past is perilous, especially when the analysts themselves have been immersed in the activities, developing particular viewpoints and, no doubt, biases. The task is rendered the more difficult in this case, for the scope of activities, the variety of projects, the number of involved people, and the range of local, cooperative, and governmental programs directly related to the preservation of library materials multiplied steadily during the 1970s.

In 1972 Haas wrote that "the complexity of the subject and the sheer quantity of the material with which we are concerned are such that, despite real progress in specific instances, the core of the problem—the deterioration of a huge number of volumes in general and research library collections—is untouched . . . there seems to be no prospect for a single and absolute solution."[37] Haas identified four major areas of needed activity which provide a convenient framework for analyzing the recent past: research, education and training, preservation and conservation efforts in individual libraries, and collective action. We shall consider each in turn.

RESEARCH

Research related to the preservation of library materials has been conducted in several places and has addressed a variety of topics. The Barrow Research Laboratory was a major center for a decade and a half. Barrow himself died in 1967, but the work was carried on for another ten years by Bernard Walker. Termination of CLR funding brought the laboratory to an end in July 1977. During that period, reports on paper characteristics, adhesives, and testing procedures were issued, and extensive investigations were carried out on a "mass" technique for the deacidification of whole books, the much sought-after treatment for retarding deterioration in large collections. Sometimes referred to as the "Barrow morpholine process,"[38] the one-hour treatment, tested extensively in the Virginia State Library, can handle up to a hundred volumes in a small vacuum chamber. When the laboratory closed, CLR negotiated an arrangement with Research Corporation (a nonprofit foundation that encourages the useful application of scientific and technical discoveries) whereby Research Corporation handles the patent, licensing, and marketing of the morpholine process. The Vacudyne Altair Corporation was licensed to manufacture the necessary equipment, and further field testing was in process at the end of the decade.[39]

Research on deacidification processes was also being continued by Richard D. Smith, whose doctoral work at the University of Chicago was partly funded by CLR.[40] Smith developed a nonaqueous deacidification solution designed for application by immersion, spraying, or brushing. The solution is patented and marketed under the name of Wei T'o. Since 1974 Smith has been working with the Public Archives of Canada on a pilot test of a mass application of his process, involving the use of a liquified gas solution in a vacuum process tank that will hold up to thirty books per one-hour batch.[41]

In 1972 the Library of Congress established a research laboratory devoted to preservation, directed by John C. Williams. With a small staff of scientists and technicians, the LC Preservation Research and Testing Office conducted a wide variety of basic and applied research projects, working in close cooperation with the Restoration Office to establish priorities and compare laboratory findings with workshop experience. Like the Barrow Laboratory, the LC research office also became heavily involved in deacidification research, receiving patents for various processes in 1975, 1976, and 1977. The technique patented in 1977, generally known as the diethyl zinc process, is LC's entry into the mass deacidification race and involves use of a volatile, toxic compound in a large vacuum chamber. By 1980, testing had progressed to include several production-scale runs treating several thousand volumes in a single one-week cycle.[42]

In August 1976, the Cellulose, Paper and Textile Division of the American Chemical Society sponsored a symposium on the "Preservation of Paper and Textiles of Historical and Artistic Value." This welcome evidence of interdisciplinary attention directed toward preservation produced an important volume of proceedings, edited by LC's John C. Williams,[43] and was followed in September 1979 by a second symposium. Of similar value have been sessions during the annual meetings of the American Institute for Conservation, which over the years have included presentations on the treatment of paper and books as well as other types of materials.

A wide variety of laboratory investigations on materials used in books has also been carried out by faculty and advanced students in the art conservation programs, and by the Center on the Materials of the Artist and Conservator, Carnegie-Mellon Institute of Research, under the direction of Robert Feller. Research and testing of book structures and bindings has been done since 1976 at the Book Testing Laboratory of the Rochester Institute of Technology, supported by the Library Binding Institute and directed by Werner Rebsamen. Several commercial interests have competed in the development of improved reproduction techniques, including the possibility of compact videodisc text storage, which may prove more economical than large-scale microfilming for preserving the intellectual content of deteriorating materials.

The disciplined, experimental approach to problem solving common to the laboratory sciences, often requiring extended periods of analysis and testing, sometimes generated impatience from a library community anxiously awaiting technological aids for the daily administration of disintegrating collections. A degree of skepticism, even despair, was creeping into the literature by the late seventies as major breakthroughs in the mass treatment area continued not to take place.[44] Nonetheless, by 1980 the results of much applied research and development in the area of adhesives, paper, boards, and other materials used in the physical care and repair of library materials were evident in the growing archival sections of major library supply catalogs, as well as in the offerings of several firms specializing in conservation supplies.

EDUCATION AND TRAINING

Writing in 1956, Edward C. Lathem made the wry statement: "There is surely no necessity of providing a profusely footnoted exposition of the obvious and widely-recognized fact that persons particularly well qualified to oversee and direct conservation activities, especially in their broadest context, are not by any means the profession's most embarrassingly over-abundant commodity."[45] He went on to suggest, "If, as is hoped, we are entering upon a period in which greater and greater attention will be directed toward conservation, it seems likely that we can expect librarians to be increasingly mindful of these needs and to think in terms of adding conservation specialists to their library's staff. The emergence of this 'age of enlightenment,' coupled with the demand for qualified personnel, may well stimulate the library schools to give more curricular emphasis to this area and its problems and students to take a more interested view of conservation matters. Hopefully, professional library organizations will become interested and play important roles in stimulating attention to training in conservation."[46]

There was little immediate response, but a generation later Lathem's hopes are being fulfilled. In 1968 Hannah Friedman surveyed library school bulletins and found not a single course devoted to the subject of conservation.[47] By 1976, however, the ALA/RTSD Preservation Committee issued its first *Preservation Education Flyer*, which identified nine accredited library school programs offering a regular course in the area. The third flier, in 1979, listed a dozen schools with regular courses and thirty-five more reporting that study of preservation was included in other courses.[48]

The proliferation of programs and workshops was even more dramatic following the New York Library Association symposium in 1968. Sponsors included library schools, libraries, professional associations on the local, state, and national level, and organizations such as the New England Document Conservation Center and the Library Binding Institute. Topics included basic introductions to the subject, administrative considerations, care and maintenance, details of binding and repair programs, replacement and preservation microfilming, and disaster recovery, in presentations varying from an hour or two to several days in length. Though no central inventory exists, it is reasonable to estimate that during the 1970s at least a hundred such events took place throughout the country, with several thousand librarians benefiting from exposure to preservation information.

Workshops and single courses are only a beginning, and in the late seventies efforts to provide more extensive educational opportunities developed. In 1977 the University of California at Santa Cruz began a series of summer programs taught by staff from LC's preservation and restoration offices. In 1978, with support from the U.S. Office of Education, the Columbia University School of Library Service offered an intensive four-week program for preservation administrators, and in 1979 the library school of the University of Maryland introduced a workshop called "Conservation and Collection Management" within its summer program on archival and special collections.

As a follow-up to the 1978 institute, the dean, Richard L. Darling, sought and received funds from the National Endowment for the Humanities for a planning study to design graduate programs for library conservators and preservation administrators. Banks, who had taught in the institute, directed the study, which resulted in a detailed plan covering curriculum, facilities, staffing, and other requirements. As this is being written, fund raising is in progress, and Columbia hopes to admit the first class in the fall of 1981. Fittingly, portions of the proposed curriculum for library conservators will be taught in conjunction with the Conservation Center of New York University, home of the first program for art conservators, insuring continued cross-fertilization between these two closely related fields.

As the educational opportunities in preservation have multiplied, so too have sources of published information, from brief technical leaflets to book-length treatises. Among major works appearing in the latter part of our review period are several library association journal issues devoted in whole or part to preservation;[49] an extensive volume on the preservation of film and tape-based materials;[50] another on the care of photographic materials[51] and one on sound recordings;[52] encyclopedia and yearbook treatments;[53] a reader of major articles on the topic;[54] a model policy statement;[55] a major bibliography;[56] a basic manual aimed at smaller libraries;[57] and a number of technical leaflets.[58]

Articles on preservation topics have also found their way more and more frequently into the general library press, with *Library Journal* most notable for the space it has devoted to the subject.[59] Specialized periodical publications have also appeared,[60] and a large "underground" press has been at work as people involved in developing programs have shared internal documents.[61] Twenty-five years ago, Tauber could point to few published "guideposts for a conservation theory."[62] We will leave it to later historians to judge when the definitive work appeared, but by 1980 the territory had been mapped and a common intellectual approach was rapidly emerging.

Activities in Individual Libraries

Accompanying the acceleration of research activities and the growth of educational opportunities was a slow but steady movement toward the establishment of preservation programs within individual libraries. We have noted already the beginnings at the Newberry Library in 1964, the Library of Congress in 1967, Yale in 1971, and New York Public Library in 1972. In 1973, Harvard designated Doris Frietag consultant on conservation for the whole library system, and Yale's program was expanded with the addition of a Conservation Laboratory under the direction of Jane Greenfield. In 1974, Columbia University established a Preservation Department under Pamela W. Darling.

In each of these libraries, the expressed intention was to address the preservation needs of the entire library and the initiative for program development came from the highest level of the library administration. Actual organizational patterns varied considerably, but in every case, except that of Harvard, the person charged with responsibility for the program was placed in a line rather than staff position and given specific authority to develop and implement programs.

By 1975, studies, surveys, and needs assessments were becoming popular managerial tools. The associate university librarian for technical services at the University of California at Berkeley assigned Jo Ann Brock to conduct a planning study for a conservation program at Berkeley. Her report, which reviewed the causes of deterioration and current condition of the collections and presented detailed recommendations for a series of conservation program elements, received wide distribution and served as a model for similar planning documents in many other libraries.[63]

During the next few years planning documents and policy statements, some produced by individuals and some by committees or task forces, appeared in a number of libraries, including the University of Wisconsin–Madison, the University of California (a joint task force from all nine campuses), Harvard, Duke, Union Theological Seminary, Stanford, Cornell, and the University of Chicago. The libraries participating in the Collection Analysis Project of the ARL Office of Management Studies, including Arizona, MIT, UC-Berkeley, UC-San Diego, and Brigham Young, also addressed their preservation needs through a special module in that project. Such planning efforts served an important function in educating a broad spectrum of staff about preservation and created an environment in which actual program development subsequently could take place.

During this period, federal funding became an important stimulus for local program development. The National Endowment for the Humanities provided support for preservation at several institutions, including the Schomburg Center of the New York Public Library, Case Western Reserve, Southern Illinois University at Carbondale, Yale, and Princeton. Yale's three-year project, which began in 1979, is of particular significance since it includes an intern component through which staff from other institutions spend six to twelve months working with the Yale preservation and conservation staff. Interns study principles of conservation, carry out a condition survey of the stacks, and participate in other components of Yale's preservation program, gaining knowledge and skills to be employed when they return to their home institutions. Since 1978, federal funds available under Title II-C of the Higher Education Act have enabled a number of research libraries to carry out specific preservation projects, often involving microfilming or professional restoration of scarce and vulnerable resources.

By the end of 1980, conservation or preservation departments had been established at several more research libraries, including the University of Utah, headed by Paul Foulger; Southern Illinois University, headed by Carolyn Clark Morrow; Stanford University, headed by

Sally Buchanan; the University of California at Berkeley, headed by Barclay Ogden; and the Humanities Research Center at the University of Texas, headed by Donald C. Etherington. Ogden had been at the Newberry, and Etherington in LC's Restoration Office, so the benefits of early development in a few places were spreading; but most libraries were still grappling with the problem of how to get started.

The approach that became common in the later seventies, involving the appointment of planning committees, task forces, or preservation "officers" whose roles were chiefly advisory rather than managerial, stands in marked contrast to the earlier pattern of creating an operating unit responsible for developing and implementing programs. The first "conservation administrators" were forced to be pioneers, dreaming up procedures and devising systems for carrying out their broad responsibilities. Different areas were emphasized within each of those first programs, in response to local conditions and the background and expertise of the individuals involved. The net result of that early development was the evolution of a broad spectrum of procedures and programs, and the ideas and experiences arising from this process were shared through personal contacts, workshops and speeches, and publications. Thus program planners in the later seventies were able to build upon the work at Newberry, Yale, New York Public, or Columbia. It became possible to short-cut the frustratingly slow, trial-and-error process of initial development to some extent, but a great deal of effort was still required within each institution to discover what was being done in other places.

In 1979, the National Endowment for the Humanities awarded a grant to ARL's Office of Management Studies (OMS) for a project which should accelerate this local development. Directed by Pamela W. Darling, the project is to codify current practices, producing procedural and technical manuals together with a guided self-study planning process. If the project is successful, it will be an important step toward the development of common standards and traditions of practice, those professional tools critical to progress in any field.

COLLECTIVE ACTION

The ARL/OMS project is one among many examples of collective action supporting the efforts of individual institutions. These collective activities may be grouped under three major headings: program support from professional organizations and associations, cooperative efforts within a regional or network framework, and progress toward a "national program."

Within the American Library Association, preservation activities grew rapidly in the years following the transformation of the RTSD Bookbinding Committee into the division-level Committee on Preservation of Library Materials. While continuing its interest in binding, the committee was also actively concerned with the availability of permanent/durable paper and sponsored a series of tours, programs, and exhibits during ALA conferences on a variety of preservation topics. As interest within the profession grew, committee meetings often were crowded with observers hoping to pick up useful information, and by 1976 there was sufficient support for the establishment of a Preservation Discussion Group to provide a structured channel for the exchange of news, views, and developments. The following year the committee set up a subcommittee on library/binders relations to work on specifications and other areas of mutual concern, and an ad hoc group undertook the creation and periodic updating of the *Preservation Education Flyer*. In 1979, the RTSD Board approved the recommendation of the preservation committee that it be reorganized and given full section status within the division. The new section numbered approximately fifteen hundred members in the first year, with its first elected officers taking over in the summer of 1980. Such formal recognition of the importance of preservation by the nation's largest library association did much to encourage preservation developments and stimulate leadership in the field.

During the same period, the role of library conservation within the American Institute for Conservation grew in significance. Perhaps the single most important factor in this process was the activity of Paul Banks, whose service as treasurer, vice-president, and then president, in 1978–80, kept the particular preservation problems of libraries clearly in focus within this organization of art and object conservators. By 1980, many librarians were members of AIC, and when specialty groups emerged the book-and-paper group was among the largest and most active.

In 1973, the National Conservation Advisory Council was established to "identify and offer recommendations for the solution of conservation problems" and to "serve as a forum for cooperation and planning among institutions and programs concerned with the conservation of cultural property."[64] Its Study Committee on Libraries and Archives, chaired by Banks, published an excellent summary of "national needs" in 1978,[65] a policy document expected to influence funding and program initiatives in the future.

The Society of American Archivists and the American Association for State and Local History were also increasingly active in preservation, conducting workshops and producing publications to support the work of their constituencies. In 1980, the National Endowment for the Humanities awarded a major grant to the former for the development of manuals and an extensive series of workshops. Communication between librarians and other groups was limited, but as the sheer numbers of preservation-conscious professionals in various fields increased, the opportunity for cooperative development also grew.

The need for institutional cooperation in coping with the massive problems of preservation has long been recognized, but the development of actual mechanisms has been slow and painful. One major cooperative approach, borrowed from the art conservation field, is the concept of the regional center, which can provide consultation and conservation treatment services and perform some educational and training functions for many institutions that could not afford to support such programs individually.

In 1973, the Council on Library Resources provided start-up funds for the New England Document Conservation Center, the first regional center established primarily to meet the conservation needs of libraries.[66] Governed by the New England Library Board, which continues to provide limited operating support, the nonprofit center offers a wide range of conservation services to libraries, historical societies, archives, and town record offices on a fee-for-service basis. In its early years the center was directed by George M. Cunha, former conservator of the Boston Athenaeum. At his retirement in 1977, the center was reorganized to allow for the appointment of a full-time administrator, Ann Russell, and a full-time senior conservator, Mary Todd Glaser. In 1980, the professional staff also included a book conservator, an assistant conservator with a specialty in photographs, and a records specialist who directed the preservation microfilming service. The center had experienced serious financial difficulties, and in its early years had trouble finding enough people with appropriate training to provide the full range of services; but by 1980 both staff and budget were well balanced and the center had received an NEH grant to expand its field service program.

The New England Document Conservation Center has provided a valuable test of the regional center approach, but as 1980 ended, although it was still the only full-service center devoted primarily to library materials, a significant portion of its income derived from the conservation of art on paper for museums and other nonlibrary customers. The continued scarcity of trained book conservators, together with the inability or unwillingness of libraries to allocate substantial funds for what is a very expensive process, probably accounts for this imbalance.

Another approach to the provision of conservation services on a regional basis took shape in New York. In 1979, with initial funding from the H. W. Wilson Foundation, the New York Botanical Garden Library established a Book Preservation Center to provide advisory services and training in proper care and minor repair of library materials to institutions throughout the metropolitan New York area. This center does not offer treatment services, but assists many small and medium-sized libraries to evaluate their preservation needs and improve their maintenance and repair programs.[67]

Other joint efforts have focused on programs not requiring the immediate establishment and staffing of a center. The Research Libraries Group (RLG) in its first incarnation as a consortium of Harvard, Yale, Columbia, and the New York Public Library had an active preservation committee. This committee established standards for the care of "master copies"—titles that one member agreed to preserve and make available for all other members; developed shipping containers for the safe transport of interlibrary loan volumes among members; recommended pricing policies and operated a pilot project of coordinated preservation microfilming; and prepared a number of reports and recommendations regarding the bibliographic control and joint storage of microform masters. When RLG was restructured and expanded in 1978, preservation activities temporarily ceased; future efforts will probably focus on exploiting RLG's emerging bibliographic system to coordinate preservation decisions.

The California Library Authority for Systems and Services (CLASS) made preservation an important priority in 1977, sponsoring a colloquium on conservation followed by extensive consultations that resulted in a major planning document for the state.[68] Case Western Reserve, with support from an LSCA grant in 1977, conducted a survey of conservation needs in Ohio, producing a report that recommended establishment of a regional center to serve a six-state area. In 1979, funds from the National Historic Publications and Records Commission enabled the Western Council of State Libraries to conduct a Western States Materials Conservation Project to "form a cadre of conservation advocates," identify needs, develop an action plan, and take preliminary implementation steps. The project concluded with a feasibility colloquium, from which came a Western Conservation Congress, which is to follow through on establishing a conservation information clearinghouse as a first step toward a complete range of services.[69]

Planning studies, reports, and recommendations play an important role in advancing the thinking of a profession on particular topics and can create an environment in which desired change can be accomplished. The process, however, is often a slow and cumbersome one, the more so in relation to the number of people and institutions involved. Nowhere is this more apparent than in the attempts to develop a "national preservation program" for libraries in the United States. We have already mentioned the early ARL studies by Gordon Williams in 1964 and by Warren J. Haas in 1972, and the Library of Congress' Pilot Preservation Project in the late 1960s. In 1976 the Library of Congress made another effort, calling a "Planning Conference for a National Preservation Program." The two-day meeting, supported by CLR, brought together librarians, conservators, publishers, and representatives of funding agencies to review the existing state of affairs and respond to a set of proposals developed by Poole.[70] The conference endorsed the major elements in the proposals, and an ad hoc advisory committee was appointed to work with LC on development. Norman Shaffer, who had directed the Brittle Books Project, was appointed National Preservation Program Officer, and the advisory committee met twice, focusing its attention initially on the need for automated bibliographic control of master microforms as the foundation for a coordinated preservation filming program. However, in 1977 Poole retired, LC was passing through a series of major reorganizations, and Congress began a series of budget slashings that seriously endangered LC's ability to keep up with existing program responsibilities. It became evident that LC would have to dedicate its available preservation resources to coping with the needs of its own collections, and once again prospects for a "national program" dimmed.

From this vantage point it may be appropriate to make several observations. The seemingly sensible recommendation that a national program be administered by a federal agency may have been a strategic error, in effect passing the buck to a government grappling with inflation and an increasing number of worthy programs seeking funding and creating the illusion for many that the responsibility no longer lay within the profession. In addition, the scope of preservation needs is so vast, the masses of materials affected so overwhelming, and the state of procedural development still so primitive that a national program would probably have been impossible even if staffing and funding problems had not intervened. A great deal more experimentation and development of program elements on a small scale will be necessary before large-scale programs can be implemented. Finally, effective coordination of large-scale programs will not be possible until a fast, accurate, comprehensive bibliographic system exists to support decision making and eliminate costly duplication of effort. We must not conclude, however, that national planning efforts have been wasted. The fundamental theories are still valid, and the very absence of a national program has stimulated local and regional efforts that will form the foundation for a national system.

In this review we have concentrated on the major events and activities that have contributed to the emergence of preservation as a vital specialty within librarianship in the United States, an emphasis that has meant ignoring significant developments in Canada and elsewhere, giving short shrift to the activities of archivists, conservators, and others in related fields, and omitting mention of many U.S. libraries and librarians who have participated in the remarkable growth of preservation activities. For the adequacy of the record these omissions are unfortunate, but for the long life of our collections it bodes well: preservation is no longer the province of the few, and as the rapid multiplying of activities exceeds our ability to recount them all, it enhances our collective capacity to preserve the materials entrusted to our care.

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Preservation comes of age

An action agenda for the '80s and beyond

by Jan Merrill-Oldham

THERE ARE FEW THINGS A librarian can predict with certainty in these mercurial times. One of them is that each year will bring a spate of employment opportunities for preservation administrators, conservators, and support staff; and that many (if not most) of these positions will have been newly created by the advertising library. It appears that the field of library preservation has finally come of age.

The signs are everywhere. State, regional, and national conferences on preservation-related topics occur with increasing frequency. Publications ranging from instructional manuals and newsletters to planning documents and technical reports comprise a growing body of literature. A Preservation of Library Materials Section has developed within the American Library Association; and preservation committees, complemented by working groups and task forces, have been established by the Association of Research Libraries, the Research Libraries Group, and the Council on Library Resources. The Library of Congress houses a National Preservation Program Office, and this year the National Endowment for the Humanities announced the creation of an Office of Preservation.

For those of us who are concerned about the short- and long-term availability of the nation's documentary resources (and we are many, both within and without the library profession), this flurry of activity is reassuring. It suggests a concerted effort to solve formidable problems, and the probability of success. Complacency, however, would be decidedly premature—for the work of salvaging endangered library materials, and of caring for those that are still in usable condition, has only just begun. The catalog of preservation goals that follows is neither inclusive nor universally agreed upon. Rather, it has been compiled to illustrate the nature and scope of the challenge that lies ahead.

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Preservation administration

Until this decade, only a few pioneering institutions supported professionally planned and implemented preservation programs. Such programs are now viewed as critical to the successful functioning of all research libraries, many of which have created preservation departments in recent years. That trend is likely to continue.

Typically, the department administrator manages the library's programs for conservation, microfilming, preservation photocopying, commercial library binding, and shelf preparation. In addition to meeting personnel, planning, and budgetary demands, the manager must plan and implement preservation training programs for library staff and users, deal with vendors, develop the reference skills necessary for the inevitable outreach component of the program, participate in cooperative activities at the regional and national level, and muster resources by communicating effectively with senior library administrators and funding organizations.

These skills are predicated on a broad knowledge base. They require a solid understanding of a variety of technologies, including those associated with binding and microreproduction; a working knowledge of bibliographic control; knowledge of a spectrum of treatment procedures, from minor repair and protective housing to blast freezing and mass deacidification; and enough organic chemistry to interpret conservation literature. The administrator must be familiar with the storage requirements of diverse media and machines, and be able to analyze environmental conditions in buildings and respond appropriately when water pipes burst or mildew is discovered in the stacks.

Ideally, administrative positions would be filled by seasoned librarians with proven management abilities and specialized preservation training. In reality, because the demand for program directors has outstripped the number of trained applicants, many new administrators must master a complex subject specialty on the job.

Ten years ago, the only means of acquiring expertise in the field of preservation was to read the comparatively scant literature and to work in one of the existing programs. Since that time, however, formal opportunities to study preservation management have evolved. At Columbia University, graduate students can earn a certificate in preservation administration in one academic year if they come to the program with a master's degree in library science.

> **"Library schools must routinely offer basic and advanced courses in preservation so that librarians understand this new subject specialty, and some become interested in a career in preservation."**

Libraries and funding agencies could maximize the benefits of such a program by offering financial support to experienced library managers interested in studying preservation and in making a career change. Educational opportunities might be offered on a competitive basis, and successful candidates expected to return from their studies to organize and run preservation programs in sponsoring institutions.

To date, the majority of positions open to preservation librarians have been at the senior management level. Entry-level positions must be established in research libraries—not only to help people prepare for management roles, but also to professionalize the field. Experience has shown that the preservation administrator uses skills and resources most wisely when assisted by other professional staff. Like a cataloging or a reference department, a preservation unit must have a balance of professional and support staff to function intelligently and efficiently.

The timely training of a substantial corps of preservation librarians to meet the long-term needs of libraries cannot be

"Ongoing educational opportunities could be provided at regional facilities, where [library] staff could attend individualized, hands-on training sessions lasting from one week to several months, at reasonable cost."

accomplished by a single institution. At least one, but probably two additional study programs should be developed in the U.S. to ensure that varied costs, locations, and program orientations will attract many applicants.

In addition, library schools must routinely offer basic and advanced courses in preservation so that librarians understand this new subject specialty, and some become interested in a career in preservation. This goal suggests another: continuing education for faculty who teach preservation in library schools, but who have not taken such a course themselves, or worked in a library with a preservation program.

Last, additional forums must be created for communication among preservation administrators, many of whom work largely in isolation at the local level. They must have adequate opportunity to exchange information and work cooperatively with people in similar positions.

Conservation training

The term "conservation," as used in this article, refers to the protective, remedial and restorative treatment of library materials, item-by-item. Full conservation treatment requires the skills of a highly trained conservator and is reserved for materials having high artifactual value, while routine conservation treatment can be performed by technicians and nonprofessional staff, and is applied to general, rather than special collections.

An unprecedented number of libraries, small and large, are taking an interest in conservation and are aggressively seeking training opportunities for their staffs. Workshops around the country usually offer instruction in routine book and paper repair and construction of protective enclosures. Such programs elicit enthusiastic responses, but leave people feeling—justifiably—that there is much more to be learned, and no convenient means of doing so.

Ongoing educational opportunities could be provided at regional facilities, where staff could attend individualized hands-on training sessions, lasting from one week to several months, at reasonable cost. These regional centers would best be developed within existing conservation units, provided additional resources came from federal, state, and private grants.

The Midwest Cooperative Conservation Program, which teaches routine conservation treatment procedures using the conservation unit at Southern Illinois University, might serve as a basis for discussing a nationwide training strategy. The advantages to the library community would be great. Institutions could avail themselves of a new and much needed service. Host libraries would benefit from additional attention to their collections and from the rich exchange of ideas that takes place when people of like interests work together.

Education of professional conservators is a much more lengthy and costly process. Columbia University has developed the nation's first formal training program (a three-year curriculum), and others must follow. A greater number of advanced conservation internships at well-equipped facilities would be a welcome supplement to academic training.

Microreproduction

The need to save large collections of materials published since the mid-19th century by reproducing them—already well documented—was reinforced by a condition survey conducted at the Yale University Libraries from 1979 to 1982. In a 17,096-volume sample surveyed in the Sterling Library, Yale's main research library, over 80 percent of all materials published in the U.S., Germany, Great Britain, and Ireland between approximately 1865 and 1930 tested positively for embrittlement.[1] "When results for the entire Yale library system's holdings were weighted and combined, a total of between 1,796,100 and 1,879,377 volumes were estimated to have brittle paper."[2] Use of acidic paper, common since around 1860, has resulted in the wholesale deterioration of a large portion of the modern record.

It is clear that we must act quickly to avoid losing tens of thousands of 19th- and 20th-century titles. Microfilming is probably the best researched, planned, and coordinated of all preservation activities, largely because of the urgent nature of the problem it addresses. A body of microfilming standards has been developed, and local, state, federal, and private funds have been earmarked for one-time and ongoing filming projects. To date, however, a few research libraries have shouldered responsibility for the mass salvage of information. They have neither the resources nor the time to accomplish the task alone; many more institutions must join them.

Libraries must identify collecting strengths and establish cooperative filming arrangements so their efforts complement others. Filming need not take place in-house, but can be contracted to commercial vendors. To encourage participation by libraries, model microfilming contracts must be developed and additional instructional materials published. (A guide to microfilming, currently slated for publication in 1986 by the Association of Research Libraries, should be an invaluable aid in this regard.)

To simplify the searching procedures that reveal whether a title is currently in print, or has already been reproduced, libraries must encourage conversion of the *National Register of Microform Masters* to machine-readable form. We must identify and evaluate commercial vendors in order to assess the adequacy of the nation's filming capacity.

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No less importantly, librarians must bring all of their persuasive powers to bear on the publishing industry, and urge the use of papers that meet the *American National Standard for Permanence of Paper for Printed Library Materials* (ANSI 239.48). When alkaline papers are used routinely for certain types of materials, a major step will have been taken toward reducing the number of books destined to deteriorate within 50 years of their publication.

Library binding

Early in 1986 the Library Binding Institute will publish a new *Library Binding Institute Standard for Library Binding*. A major departure from earlier standards, it emphasizes not only the durability of the library-bound volume, but also its proper functioning—acknowledging that books must open well if they are to be easily read and photocopied. Oversewing and side sewing were once the only "class A" methods of attaching the leaves of a volume, but the new standard includes three other treatments for this problem. The new document challenges librarians who use commercial binding services by offering them a choice.

Many of the methods and options in the new standard (e.g., "recasing") are less radical and damaging than traditional approaches. However, because they require significantly more time to execute, they will be more costly. In order to develop binding guidelines appropriate for particular collections, librarians will need to become familiar with the new standard, read supporting documentation (some has already appeared in the literature), and take advantage of training opportunities at conferences and workshops. The latter must be planned and implemented by library associations and library binders working together toward mutual goals.

Environmental control

Although we are aware that heat, light, excessive moisture or dryness, and environmental pollutants hasten the deterioration of library collections, few libraries—even those housing large collections of important materials—have been able to substantially improve existing heating, ventilation, and air-conditioning systems, or to install new ones. Publication of the *American National Standard Practice for Storage of Paper-Based Library and Archival Documents* (currently in draft form) may provide additional justification for institutions seeking necessary funds. While the costs of improving climate control are very high, they must be met. Local funding drives are a potential source of support, but they must be well organized, maintain their impetus long enough to raise the requisite resources, and include a strong educational component that highlights the significance of the renovation project.

Flaws in the design and engineering of existing library buildings should serve as fair warning to today's architects and planners that they must consider the maintenance of an appropriate collection storage environment at the outset of any renovation or building project. Preservation personnel from the library staff or preservation consultants should be involved in all planning activities. We must rethink the open floor plans in vogue in recent years, for we know well that optimal conditions for housing books and for reader comfort are in conflict. We must take a fresh look at earlier designs that incorporate core stacks, and take advantage of new knowledge and improved technology when adapting them. The building project recently carried out at the Newberry Library in Chicago is an example of what can be accomplished.

Research and development

"In our throw-away society, where today's reading is tomorrow's trash, we must reintroduce the notion that library materials are among the most valuable and fragile of our shared resources."

Library preservation abounds with unsolved problems and unanswered questions. For example, two years ago the Environmental Protection Agency issued new guidelines for using ethylene oxide, a gas that sterilizes moldy and insect-ridden library materials effectively and relatively inexpensively. In response to new evidence on the toxicity of ethylene oxide, libraries and archives shut down most fumigation chambers. Since that time there has been a great deal of speculation regarding alternative treatments, but little scientific research to determine their effectiveness. Affected materials pile up in storerooms or are discarded, depending on the strength of a library's conviction that fumigation services will eventually be restored.

While the Library of Congress is conducting model programs on mass deacidification and optical digital disk storage, it lacks the resources to investigate the broad range of conservation issues that have been raised in the profession. What are the long-term effects of applying security labels and strips to library materials? How are conservation supplies (e.g., box board, adhesive, book cloth) different from one another? How do their aging characteristics compare? How does encapsulation of acidic paper between sheets of polyester film affect the paper's rate of chemical deterioration? What types of volumes should be rounded and backed by a library binder, and which are best left square-backed? The list goes on.

The profession must find a way to solicit suggestions for research from conservators, conservation scientists, and preservation administrators. Based on a careful weighing of those suggestions, a detailed agenda for a national research and testing program can be established. That agenda could serve as a catalyst for identifying resources to support rigorous scientific investigation.

Educating the public

It is apparent that the price of preserving the materials accumulating in libraries will be high, and that without substantial public support we will achieve only our most modest goals. Already, federal monies from the National Endowment for the Humanities, National Historical Publications and Records Commission, National Museums Act, and Department of Education Title II-C grants, and private funds from the Andrew W. Mellon Foundation, Council on Library Resources, and other agencies, support substantial preservation activity.

The State of New York has led the way in designing and adopting legislation authorizing state funding for preservation. This year each of the state's 11 research libraries (public and private) received $90,000 for special projects; another $200,000 was distributed to 22 smaller institutions. We must work through library associations and state libraries for similar legislation in all states, and for increased federal funding.

How can we convince the public that maintenance of library collections is worthy of tax dollars? We can begin the education process at the local level. In our throw-away society, where today's reading is tomorrow's trash, we must reintroduce the notion that library materials are among the most fragile and valuable of our shared resources. Public relations activities can take the form of posters, leaflets, exhibitions, audiovisual programs, lectures, and newsletters. We must campaign in newspapers and on television—for an educated public will be our strongest ally. We must teach young children the value of libraries, and how to treat their contents with care. A series of audiovisual and printed publications for youngsters might help to create a new generation of responsible readers.

There are no easy answers to preservation problems, nor will we be able to sidestep costs, which promise to be great in terms of time, dollars, and professional commitment. Margaret Child, assistant director for research services at the Smithsonian Institution Libraries, has suggested that "everyone concerned with the preservation of documentary resources faces a major lobbying effort, if library preservation is indeed going to become a national campaign of the dimensions associated with the preservation of other kinds of national resources . . . such as clean air . . ."[3] It is up to the library profession to state its case, and to state it powerfully. ☐

Notes

1. Walker, Gay, Jane Greenfield, John Fox, and Jeffrey S. Simonoff, "The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library." *College and Research Libraries* 46:2 (March 1985):124.

2. Ibid., p. 119.

3. Child, Margaret, "Federal Funding for Preservation." In *The Library Preservation Program: Models, Priorities, Possibilities*, ed. by Jan Merrill-Oldham and Merrily Smith (Chicago: American Library Association, 1985), p. 93.

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PRESERVATION IN RESEARCH LIBRARIES: A NEW APPROACH TO CARETAKING

by Jan Merrill-Oldham

Preservation is a topic of great interest to the modern world. While it has been traditional among societies to pass cultural records and artifacts to succeeding generations, technology, relative wealth, and enthusiasm have conspired to drive preservation ever higher on mankind's grand list of priorities. We live in an age when whole towns are being refurbished (witness Salem, Massachusetts), giant monuments are restored at enormous expense (the refurbishing of the Statue of Liberty is expected to cost in the range of $39 million),[1] and fine buildings are being rescued from the wrecker's ball — even if only to save a beautiful facade. We have also been forced to take a fresh look at our use of natural resources and to seek ways to preserve them for ourselves and for the future.

When a preservation librarian, then, is asked, "What do you do?", and he or she responds casually, "I'm into preservation," people inevitably assume that the librarian is a champion of architecture, statuary, farmland, or exotic species. The community at large knows little about *library* preservation, nor do most librarians understand it well. It is a subject that is not often written about for the general public, and it has only recently been taught in library schools — often by instructors who have had neither the opportunity to learn about this exacting field from specialists, nor to work in a library where a preservation program is in place. On college and university campuses that are fortunate enough to have libraries with established preservation departments, the academic community is rarely more than casually aware of that fact, if at all. Why have such departments developed, and what is their charge?

Preservation librarianship has evolved as a specialization within the profession largely because of a growing awareness that research library collections are in a deteriorated state. The reasons for this include the inhospitable environments in which collections have been housed, the repeated use they receive, and the methods and materials used in their manufacture. Most modern books are very poorly constructed and are printed on paper that has a shelf life of only forty to fifty years. Color film and photographs fade quickly, and audio and videotapes are subject to both chemical and mechanical damage, as are maps, manuscripts, and most other media that communicate information. Surprisingly, during this century librarians have given little notice to the physical condition of the collections in their care. The lion's share of attention has been focused instead on building collections, automating cataloging procedures, and providing increasingly sophisticated reference service for readers.

Unfortunately books, like cars, do not fare well without a generous amount of maintenance. Some startling statistics have emerged from the condition surveys conducted in recent years by a few of the larger research libraries. Yale, for example, examined a random sample of thirty-six thousand volumes from its collections during 1979-83 and discovered that the paper in over 80% of all sampled volumes published between 1860 and 1940 was brittle. As paper embrittles it becomes increasingly delicate; eventually it can barely be handled without breaking. The biggest libraries were the first to address this problem in an organized fashion. The New York Public Library and Columbia University began microfilming in the 1930s. Later, formal preservation programs were established — at Chicago's Newberry Library in 1964, the Library of Congress in 1967, Harvard in 1970, Yale in 1971, the New York Public Library in 1972, and Columbia in 1974.

Individual institutions have organized their programs differently as each attempts to identify needs, establish priorities, and implement plans that would be appropriate within both a local and a national context. It is only within the

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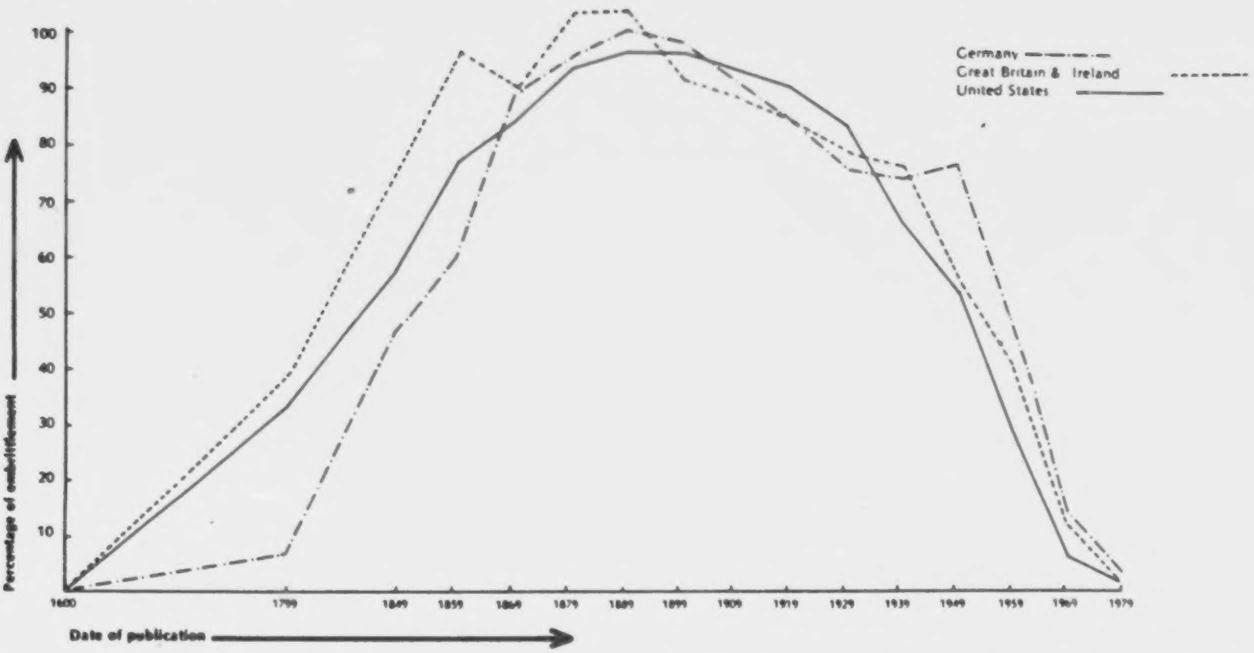

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last few years that any consensus regarding organizational structure has seemed close at hand, and even now opinions differ on the fine points. In general, however, as more and more research libraries rally to the cause and begin to spend time and money to keep library materials on the shelves and usable, they are increasingly likely to establish preservation departments that consist of these discrete units and activities:

Conservation. Conservation is the physical treatment of materials — their repair and restoration — carried out by conservators and conservation technicians. It involves activities ranging from minor repair of paper and bindings to sophisticated restoration procedures, which require years of professional training to execute properly. A rigorous examination of the methods and materials used to repair research materials has resulted in the obsolescence of those brightly colored self-stick tapes that were once the mainstay of many mending operations and that have aged poorly and damaged the books to which they were applied. State-of-the-art procedures involve the use of high-quality cloths and adhesives, instead, and result in repairs that the untrained eye is unlikely to notice. Scotch tape has been supplanted by a reversible (i.e., easily removed) heat activated tissue and by Japanese paper applied with wheat starch.

Besides book and paper repair, hand book binding (reserved for items too special to send to a commercial binder), pamphlet binding, and box making are apt to be part of a conservation program. Also included are the surface cleaning, washing, deacidifying, mounting, encapsulating, and matting of maps, documents, and prints. A research library may confine its conservation activities to work that can be carried out with the equipment likely to be found in a book binding shop, contracting for services from a regional conservation facility or private conservator when very technical analysis, testing, equipment, and skills are required to carry out a treatment. In some libraries, the days are gone when untrained students were handed a few rolls of tape and set loose to exercise their creative abilities. Now, repair work is performed under the supervision of a conservation technician. The technician is likely to have a bachelor's degree, may have a master's in librarianship, conservation librarianship, fine arts, or another closely-related field, and has trained under a conservator or highly skilled conservation technician. If a library can afford to, it may even hire a conservator to develop a sophisticated treatment program. Conservators typically train for many years to acquire an appropriate level of expertise and are usually responsible for restoring valuable items from special collections.

Binding Preparation. Most research libraries send unbound journals and worn and damaged books to a commercial library binder. The work of the commercial binder is easy to recognize because of the distinctive pyroxylin-impregnated cloths used by the industry. Brilliantly colored, hard surfaced and glossy, these cloths are tough, abrasion-resistant, and impervious to water and oils. The goal of the commercial bindery is to produce a volume that is sturdy enough to stand up to repeated use at a price well below what it would cost a library to bind the volume in-house.

Historically, the bindery preparation unit, which prepares books for shipment to a bindery, has been administered by the library's serials department or has been integrated into an all-purpose processing department. It has been mainly concerned with the record keeping involved in getting materials to the binder and back and with determining what information should appear on the spine of each volume. As bindery preparation comes under the aegis of preservation personnel, the focus of activity is changing. The technologies employed by book manufacturers and commercial binders are under scrutiny. Volumes are being closely examined to determine how they were bound originally, and based on that information and the condition of the volume, how they can best be *rebound* by a library binder. While in the past library binders relied on only one method of attaching pages together, preservation librarians are beginning to request a variety of different treatments, with the goal of ensuring that books and journals open well, pages can be photocopied easily, and volumes incur as little damage as possible in the process of being bound. The bindery preparation unit, once it is pulled under the preservation umbrella, begins to deal with the book not only as a bibliographic entity, but also as a physical object that needs to function properly.

Reproduction. It is largely because paper manufactured since the mid-nineteenth century is acidic that it loses its flexibility. Once a book becomes brittle, the only way to salvage it is to take it apart, chemically treat each page, encapsulate each between sheets of polyester film, and bind the encapsulated sheets together — a prohibitively expensive process in nearly all cases. The alternative is to reproduce it. When a book is identified as brittle by a library staff member, a subject bibliographer must first determine whether it should be retained. Some volumes — but not many — are withdrawn either because they are no longer appropriate to the collection or because they are out of date and not of historical interest. If the volume is to be kept, the bibliographer must determine if it has artifactual value, perhaps because of an important binding, significant and irreproducible illustrations, or distinction as an edition. In this case it cannot be reproduced, but rather must be restored, boxed pending restoration, or simply left untreated to await technological innovations that will lower the cost of treatment. For brittle volumes that are judged important chiefly for their informational content — and that is the vast majority — an attempt is made to purchase a reprint or perhaps a new edition. That having failed, the remaining options are to photocopy it onto acid-free (i.e., alkaline) paper, to microfilm it, or to put it back on the shelf until it literally crumbles.

The strength of photocopying is that it results in hard copy; a *book* goes back on the shelf. Its weaknesses are that many graphic images do not photocopy well, the library has lost the option to film the title if the original is discarded, and while a local need is met, a national one is not. Microfilm, on the other hand, is a more sharable resource. There are strict guidelines for preservation microfilming, and a mechanism exists for reporting microfilmed titles to other libraries: *The National Register of Microform Masters*. Once a master film has been made by a library, positive copies can be produced inexpensively and sold to other libraries trying to replace *their* brittle volume.

Shelf Preparation. All plating, labelling, and identification stamping takes place in the shelf preparation unit. When these activities are carried out in a preservation-oriented environment, they assume new importance. All procedures — as well as the nature of the adhesives, inks, and papers used in the marking process — are scrutinized, and adjustments made whenever possible to minimize the damage they do to books.

There are many other responsibilities that fall within the purview of a preservation department, but that do not translate into operational units:

Staff and Reader Education. The development of orientation programs, printed and audiovisual teaching tools, and consciousness-raising posters, flyers, and brochures is essential if the people who work in and use libraries are to learn what they can do to extend the life of library collections. We live in an age of disposable reading material — newspapers, magazines, paperbacks. Even the library books we buy are rarely manufactured with repeated use in mind. Preservation librarians seek effective ways to teach people how to handle materials properly and to remind them that libraries are recycling collections of materials. There are correct ways of positioning books on shelves, taking a single book off the shelf, dealing with film jammed in a microform reader, and carrying borrowed books home. Every item should be returned in a condition unchanged from when it was borrowed. Preservation personnel also work with other library staff members to find ways of changing procedures that have damaging effects on collections. The use of paper clips and rubber bands is gradually phased out of processing routines, shelvers develop the fine art of loading book trucks properly, and curators turn off lights in restricted stack areas when no one is working there. Ideally, we all begin to assume the role of caretaker and become more interested in the condition of the materials we handle daily.

Environmental Control and Disaster Planning. Heat, light, and dirt hasten the demise of paper, cloth, adhesives, plastics, and other components of library collections. Preservation personnel are trained to use environmental monitoring equipment, to interpret the data it yields, and to make recommendations for improved climate control based on findings. When the environment becomes extremely hostile (in the event of fire or flood, for example) it is the preservation librarian who oversees the salvage procedures necessary to restore as many items as possible to usable condition. This job is made easier by the preparation of a disaster plan that includes such information as what collections within the library to rescue first in the event of a major problem. It also involves making prior arrangements with support services, such as freeze drying facilities and preparing a stockpile of necessary supplies — plastic sheeting to throw over stack ranges, flashlights, and freezer paper.

Outreach. The preservation department regularly acts as a resource for the community it serves and for libraries that have no preservation program — and that is most libraries. People frequently need to know what to do about mold, mildew, or an insect infestation. The questions they ask are diverse, however, and may concern how to pack books for long-term storage, what kind of paper and binding to request for an upcoming publication, and where to get a favorite tome rebound.

In summary, it is the mission of the preservation department to ensure that library materials are in usable condition, through preventive maintenance and corrective action. That goal cannot be viewed, however, as separate from larger issues. As internal competition for library resources escalates, so too does the volume of material that must be collected and preserved, and libraries are being forced to rely on cooperative collection management. It is becoming increasingly impossible for research libraries to develop in isolation. Facing the imminent loss of nearly all of what has been published since the mid-nineteenth century, organizations such as the Association of Research Libraries, the Council on Library Resources, and the American Library Association are urging members to analyze their collections, identify collecting strengths, and take responsibility for both buying and preserving materials in those subject areas. Warren Haas, President of the Council on Library Resources, justified these demands in a recent position paper: "The idea of the 'nation's collection' must be established, along with a better sense that acquisition and preservation are opposite sides of the same coin. Individual research libraries must become, in a functional sense, 'branches' of the national collection. Individually, as they budget to buy, they must budget to preserve."[2] The price will be high, but weighed against the loss of our documentary resources, we can only decide to pay.

FOOTNOTES

[1] "A Colossus Undertaking...Renewing Liberty's Exterior & Interior," *Technology & Conservation* 8 (Summer 1983) 6

[2] Haas, Warren. "Preserving Our Intellectual Heritage: General Directions and Next Steps." (Washington, D.C.: Council on Library Resources, April 1984) (Unpublished)

Section 2: The Physical Environment

from LIBRARY JOURNAL
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Environmental Standards For Storage of Books And Manuscripts

by PAUL N. BANKS

THIS ARTICLE is a slight adaptation of a statement of guidelines on environmental standards as projected for the new Newberry Library bookstack building. It attempts to deal, in summary form, with all of those factors which might be included in building planning which can influence the preservation, deterioration, or destruction of books. Specifically not dealt with, however, are human comfort or efficiency, as these are within neither the author's bailiwick nor competence. Fire and water as potentially damaging factors are touched upon, but security from theft is not.

One very important general principle is the separation of books and people insofar as this can be achieved without violating the basic *raison d'être* of a library. The conditions which make a favorable environment for people are not the same as those which are conducive to the preservation of library materials, the oft-repeated myth to this effect notwithstanding.

In outlining such standards as these, there are difficulties in balancing differing scientific opinions, reasonable cost and desirable goals, or conflicting goals. Some of these factors will probably have to be resolved by negotiation among trustees (as controllers of cost), architects and engineers, and conservation-oriented staff members.

Temperature

It has been widely stated in the literature that temperatures in the range of 68° to 74°F.[1] are optimum for the preservation of library materials. It is a fact of chemistry that the speed of most chemical reactions approximately doubles with an increase in temperature of 10°C.[2] Since the deterioration of library materials is a series of (often complex) chemical reactions, it follows that theoretically, at least, the higher the temperature, the faster the deterioration of the materials. There is a good deal of experimental evidence to bear out this theory. Indeed, the most satisfactory method found to date of estimating the longevity of paper is to "accelerate its aging" by heating it under specified conditions, and measuring its physical and chemical qualities before and after such "accelerated aging."[3] In addition, the W. J. Barrow Research Laboratory is engaged in a long-term experiment on the effect of cold-storage (around freezing or zero; I'm not at the moment sure which) on paper. Although there are not enough results for publication as yet, the evidence thus far obtained (as reported orally by Dr. Robert N. DuPuis, director, at the time this was discussed) fully bears out the idea that the colder, the better.

The reason that a temperature on the order of 72°F. has been almost universally cited is, of course, because that is the temperature at which people are generally the most comfortable, and it is usually difficult or impossible to separate books from people, even in storage facilities for the former.

If we assume that the lowest temperature possible is the best for the preservation of books, there are at least three factors which dictate lower limits. The obvious one, of course, is people. While it is desirable from the standpoint of preservation that book storage should be as much isolated from people functions as possible, obviously the two cannot be wholly separated if the books are to be serviced for readers. Where book storage can be separated from book use, one might set the lower limit of temperature as that which pages (wearing jackets or sweaters) would tolerate for paging books. Reshelving, moving, shelf-reading, and the like would, of course, also have to be considered. People do work in refrigerator and freezer lockers, but this is probably extreme.

Another factor which must be considered in setting lower limits of temperature is the problem of condensation. If books were stored below a certain temperature, moisture would condense on them, causing damage, when they were brought out into a "people-area" for use. If we can be reasonably certain of a maximum temperature of 76°F. and a maximum relative humidity of 50% in any reading room, the books could be stored at a temperature of as low as 57°F. without risk of condensation problems for books being used. The cost of maintaining a much lower than usual temperature during the summer will be a significant consideration.

It is thought that cycling, i.e, variations in temperature and humidity, is damaging to paper.[4] This probably has to do with invisible, internal physical stresses set up by the responsiveness of paper to these changes. It is safe to assume that such damaging effects are magnified many-fold with regard to a whole book, which is a structure composed of materials with differing responses to temperature and humidity. For this reason it might be contended that books should be stored at the same temperature at which they are read. I be-

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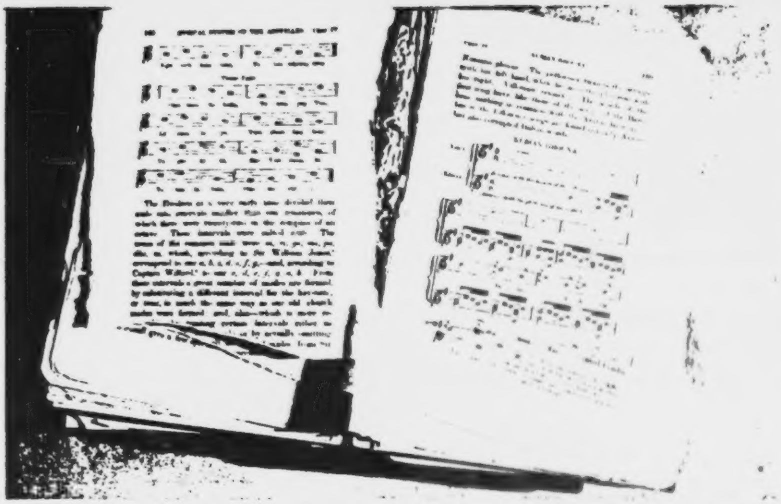


Unfavorable environmental conditions, especially high temperatures, hasten the deterioration of unstable book materials

lieve, however, that the frequency of use of any given book in the Newberry's collections is so low that the gains from cold storage would far outweigh the losses from the infrequent cycling caused by withdrawing a book from the stacks for use. This situation will, of course, vary in different libraries. I know of no laboratory work on this point, and I believe that it is not a question which is amenable to easy laboratory solution because of complexity and diversity of books in any library collection.

It is of interest to consider the criteria for temperature proposed for new buildings of the Library of Congress and the British Museum Library.[5] (In neither case are the specifications absolutely final.) In LC's standards for temperature the range is from 68° F. for book storage areas to 75° F. for "people" areas. It has been emphasized by LC that the only reason that the book storage temperature is not lower is that most areas of the building must be capable of serving as either storage or activity areas, as needs change over the years.

The provisional British Museum Library specifications are 55°-65° F. in closed access book storage areas and 65°-70° F. in all other areas. My recommendation is that the temperature level for book storage areas be set at 60°F., ± 5°.

Humidity

With temperature, one can state with some confidence an ideal, with qualifications based solely on practical considerations. Such is not the case with relative humidity; scientists disagree even about what the optimum is, leaving aside any practical considerations. There seem to be two principal reasons for the disagreement. In the first place, so far as paper is concerned, there are indeed two opposing (and both valid) arguments: increased moisture content increases the rate of deteriorative chemical reactions on the one hand,[6] and on the other, reduced moisture content reduces the flexibility of paper, thus increasing the likelihood of breaking (of brittle paper) in use.[7] There is no sure way to validly weigh these two conflicting factors because of the great number of variables obtaining in any given case, such as the brittleness of the paper in question. Those who advocate low storage humidities (that is, substantially below 50 percent) are basing their recommendations solely on laboratory studies of the aging of paper, not on whole books which are composed of a variety of materials, and which in use might be said to be moving objects. Natural adhesives are particularly subject to desiccation and embrittlement, with consequent breaking down of the book structure in use. In addition, different book materials react to different degrees with changes in moisture content, and boards which may be flat at one R.H. will not be so at another, because the tensions were balanced under the former condition. The difference to be observed between the "life" in books in cool, damp English libraries and the desiccated, embrittled condition of those in hot, dry American stacks is striking.

The limits set by the responsible workers in the field range from 30 percent to 65 percent R.H., usually plus or minus five percent from whatever optimum is recommended.

There seem to be two practical limitations on optimum control of humidity: cost and condensation. Obviously, it is expensive to keep humidity up in the heating season in cold climates and down on humid summer days. In addition, maintaining relatively high humidity in cold winters causes serious problems of condensation, with consequent building damage, unless stringent precautions (such as double window glass) are taken. If this factor is taken into account in the design of a new building, however, the problem of condensation can be handled to a large extent.

Fluctuations in humidity seem to be considerably more serious even than fluctuations in temperature; certainly some of the effects of extreme changes in humidity are quite evident on the visible level, as distinct from variations in temperature whose effects are more on the microscopic or molecular level. Variations should certainly be kept within ± six percent from the level decided upon, and closer control would undoubtedly be desirable if economically and technologically feasible.

The Library of Congress's standard for humidity is "40 to 50 percent, but will accept 45 to 55 percent if this would simplify the final design of the system. . . . If 45 percent is the design R.H., then diurnal variations should be held within a range of 42 to 48 percent. Cycling at infrequent intervals. . . is less damaging and can be tolerated provided the total range does not exceed 12 percent; i.e., six percent on either side of the design figure." The British Museum Library's tentative standard is 55-65 percent in book storage areas, and 40-50 percent for microforms.[5]

My own recommendation would be, as it has been for some time, for a "design figure" of 50 percent R.H., with (as LC specifies) ± three percent diurnally and ± six percent seasonal tolerances.

Air Cleanness

All impurities in the air are harmful to books. The most serious gaseous pollutant is sulfur dioxide, but also important are oxidants such as nitrogen oxides and ozone. These should be removed entirely from the air entering the library.[8,9]

Particulate matter is highly undesirable also, although its effects tend to be more superficial than those of the oxidizing and reducing gases mentioned above. Dust settling on books is disfiguring; when superficial dust on a book is combined with the perspiration and skin oils of people handling the books, fingerprints result which are virtually impossible to remove. In addition, the handling of books required to dust them, while considered the lesser of evils, is nevertheless damaging. Moreover, dusting of both books and furniture, floors, and other surfaces in the library is expensive.

Particulate matter may be removed from air by filtration, by cyclone "filters," and by electrostatic precipitators. Electrostatic precipitators are not considered acceptable for library and museum applications because of their production of ozone.[8] "Oil or viscous impingement filters" have been excluded from consideration by the Library of Congress, possible because of the production of aerosols of their own.[5] These considerations would seem to limit filtration to dry filters which provide the maximum filtering efficiency which is economically feasible. (The higher the filtering efficiency, the higher the cost, because of more frequent changing of the filtering media, and because greater filtration requires larger fans and more energy to draw a given amount of air through the filters.)

The Library of Congress has specified a minimum filtration efficiency of 95 percent.[9] S. I. Rottmayer has suggested an efficiency of 90-98 percent (AFI Spot Test Code) for the Newberry's new building.[10]

Some sulfur dioxide is removed by plain water washing, but the wash water must be kept at a pH of 8.5-9.0 to remove all SO_2.[11] There are sometimes difficulties in maintaining this pH in existing systems because of either corrosion or scaling in the system. I assume that it is possible to design the washing system so that the recommended pH can be maintained, as has presumably been done for 40 years at the Folger Shakespeare Library.[11] The Library of Congress has specified water washing at pH 8.5-9.0.[9]

It is my understanding that oxidants are not removed by alkaline washing, and that activated carbon is used for this purpose at the Winterthur Museum and the Beinecke Library.

The British Museum Library has specified (perhaps somewhat simplistically) that "dust, ozone, oxides of nitrogen and sulphur dioxide are harmful to the collections and should be absent from the circulating air."[8]

Ventilation

The circulation of cleaned and tempered air must be adequate to prevent pockets of stagnant air and "microclimates" which are at variance with the stated standards.

Light

There are three principal factors which control the degree to which light causes damage to library materials. These are the spectral distribution of the light, its intensity, and the length of time that the material is exposed to the light.[12]

The electromagnetic spectrum ranges from cosmic rays on the short end to radio waves on the long. Somewhere in between lies the range from ultraviolet, visible light (violet, blue, green, yellow, orange, red), to infrared, stated in order of increasing wavelength. Our immediate concern is with the shorter end of the spectrum; it has been calculated that radiation in approximately the middle of the ultraviolet range (360 millimicrons) has a damage factor of 145 times in relation to green light (550 millimicrons), which is in approximately the middle of the visible spectrum. As the wavelength increases, the damage factor is very slight, but still exists as long as oxygen is available to the book or other object.

The practical implications of this are: For storage and exhibition areas, all ultraviolet radiation should be eliminated (fortunately, not particularly difficult or expensive to do); intensity levels should be kept as low as possible, and periods of exposure should be kept as short as possible. It follows also that the more valuable are the items involved, the more stringently these precautions should be observed.

Daylight is very rich in ultraviolet radiation; fluorescent tubes are rich in UV, while incandescent lighting units have only negligible amounts. There are fluorescent tubes which contain UV filters; however, they are more expensive than conventional tubes, and of course filtered tubes must be replaced with filtered tubes, incurring ongoing expense. There is the additional drawback that an uninformed maintenance man or an economy-minded purchasing agent might substitute unfiltered tubes unbeknownst to the curator or library administrator. Alternatively, sleeves of ultraviolet-filtering plastic which slide over fluorescent tubes are available; the existence of a separate sleeve over a fluorescent tube might be some sort of a signal to those replacing burned-out tubes. Their cost can be distributed over the life of several flurorescent tubes, but it should be noted that their effective life is not unlimited.

My specific recommendations regarding lighting are: as a guiding principle, lighting levels should be kept as low as is consistent with efficiency of the activity involved wherever library materials are stored, used or displayed (including those hung on walls.)[13] In these areas any fluorescent lighting should be protected with UV filtering sleeves.[14] Switches with timed shut-offs might be considered in stack areas.

The question of lighting for use should be considered as the purview of a lighting engineer and not that of the conservator.

Exhibition

The fundamental concepts discussed under temperature, humidity and light apply just as well to materials on exhibition, but there are some special problems. Irreplaceable materials should never be permanently exhibited, because of the effect of light in the presence of oxygen. Thirty days is often set as a limit for the amount of time that materials should be left on exhibit. Certainly all lighting for exhibit cases should be free of ultraviolet. Light levels should be kept as low as possible; in addition to the problem of damage from visible light, intense spotlights produce infrared radiation which heats the objects spotlighted.[15]

Heat and humidity are particularly difficult problems in exhibition cases. It is widely (and I believe entirely correctly) held that all light sources should be outside the cases themselves to prevent a buildup of heat and a consequent drop in relative humidity. In addition, where fluorescent lights are used, ballasts, as well as giving off heat, sometimes overheat or even ignite, with disastrous consequences.[16] There can be problems with cases which are against exterior walls, depending of course on the construction of both the building and the cases. In buildings in which the temperature, humidity and pollution levels are not controlled, sealed cases are sometimes recommended; however, where these factors are under control, it is probably safer to provide ventilation (perhaps even forced ventilation at a low level) to assure that the materials being displayed are kept at the same conditions under which they are stored. Forced ventilation could cause problems of dust accumulation; filters might be advisable in the ventilation system.[17-19]

Shelving and Transportation

Careful thought should be given to the selection of shelving, and especially of book supports (bookends) to prevent sources of damage to books. Shelving should be smooth and free of sharp edges and corners which might damage the books. Since it is extremely important for the health of books for them to be held firmly upright on the shelves, but not so tightly that difficulty is encountered in removing them, book supports should be selected which are sturdy and which hold the books firmly, but which do not bind or present other difficulties in loosening for removal of books from tightly-packed shelves. The most common type of bookend, which has a tongue which slides under the bottom of the books adjacent to it, is probably not ideal. Bookends should be thick enough that they are visible, so that the contents of books are not damaged by inadvertently forcing them over the bookend ("knifing").

Some book supports are integral with shelving designed specifically for their use; any possible conservation advantages of such shelving-support systems should be carefully explored before making the very major commitment of shelving specifications for a new building.

Where classified collections are involved, it is important to have a highly systematic and rigidly followed scheme of size designation, to discourage or prevent the necessity of jamming books onto shelves which are just too closely spaced, storing such books on their fore-edges, or flat on top of other books.

It is extremely important to provide adequate shelving for those oversize volumes designated as "+'s" or flat folios. The ruggedness of the structure of such volumes is rarely commensurate with their size, their weight, and with beating they take because of their inherent unwieldiness.

Ideally, each such volume should have a separate shelf. If this is considered impossible economically,[20] an alternative would be to provide shelving for a maximum of three or four volumes each, but with adequate and clearly designated "transfer stages" where the top volumes of a stack may be placed while a lower one is being extracted.

Ample aisle space in flat folio sections is also vital, to help minimize bumping of the volumes.

Perhaps all "+'s" should be consolidated in one specially-designed storage area of the stack.

The present Newberry book trucks are highly unsatisfactory, because of the level shelves, which permit books to be easily shaken off the truck on rough floors or while going over door sills and the like. Trucks with shelves which are sloped slightly inward toward the center would reduce this problem significantly, but the trucks should probably have a flat bottom shelf, the full width of the truck, where large folios and atlas volumes could ride safely.

If non-mechanized paging is to be utilized in the new building, it would seem to be important to have a generous quantity of small, easily maneuverable trucks available to encourage pages to use a truck rather than to carry stacks of books by hand, thus encouraging dropping the top ones off the pile.

Any type of mechanical book conveying system must be examined very carefully for its potential for damage to the books. Peter Waters has characterized the Library of Congress's old book conveyor as a great artificial aging machine.

Storage of Microfilm

Air purity is, if anything, more important for microfilm than for paper and leather. Regarding temperature and humidity, I will quote McCamy and Pope: "Low temperature and humidity appear to be desirable storage conditions. It is recommended that materials to be in inactive storage be placed in the can in equilibrium with air at a relative humidity of 15 to 20 percent at 50 to 60° F. and that films for active files be placed in the can in equilibrium with air at a relative humidity of 30 to 35 percent at 50 to 60° F. It is recommended that the storage temperature not be permitted to exceed 70° F. and that it be maintained between 50 and 60° F. where practical. Films may be stored at a lower temperature if they are warmed sufficiently before opening to avoid condensation on opening the can."[21]

Several questions are raised by these standards. If the book storage conditions approach those recommended for microfilm, films might safely be stored in regular book storage areas. If not, a special vault for master microfilms might be considered. (It must be remembered that fire, for instance, will often only char the edges of a book, leaving it usable or copyable, but, partly because of miniaturization, it takes relatively less damage to a microfilm to make it worthless.) It is also possible that master negatives should not be stored on the library premises at alll, but left in controlled vaults of a commercial microfilm organization. As reading copies are presumably relatively easily replaceable, and as they are inherently considered expendable if they are given to readers to use, one need not be quite so concerned about their preservation.

Disaster Control

Fire and water damage are obviously among the potentially most devastating destructive influences on library materials.[22-25]

A sensitive fire detection and alarm system would seem to be an absolutely essential minimum precaution in an extensive and valuable collection of library materials. The question of an extinguishing system is a little more difficult. It is widely (although by no means universally) held that sprinkler systems may cause more harm than good. It certainly seems to be true that water causes as much damage as fire; while many or most books in a fire will have only scorched edges and bindings, water will penetrate the whole book, causing great difficulties in restoration. Water-damaged books on coated paper are usually totally unsalvageable. In addition, sprinkler systems do sometimes go off when there is no fire, and any type of water pipe is capable of leaking or bursting unexpectedly. There is now, however, a new type of sprinkler system in which there is no water in the standpipe(s) until a sprinkler head actually opens. This system may reduce some of the objections to sprinklers in libraries.

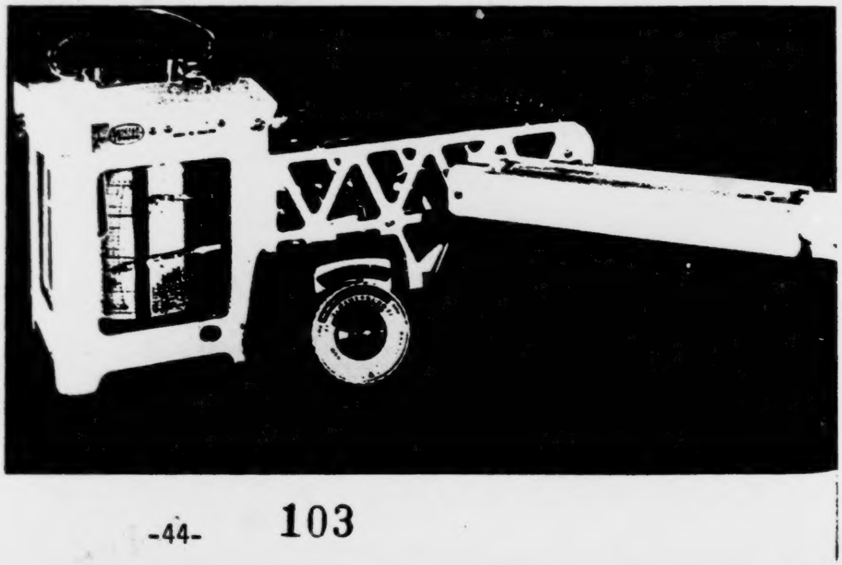
Various types of automatic, central extinguishing systems utilizing carbon dioxide or Freon, neither of which is supposed to damage books, would probably be as near ideal protection as possible, although they are quite expensive. The Freon system is apparently preferable, as it poses less hazard to occupants in the area of discharge.[26] (The Beinecke stack has a CO^2 system; the Winterthur and Rosenbach museums have Freon.)[27,28]

The air-conditioning system must be designed with automatic dampers to prevent the spread of smoke and flame in the event of fire, and means should be provided for exhausting smoke from the building following a fire.[29]

The highest fire risk by far is encountered during construction or remodeling. Inherently hazardous materials are present, perhaps in abundance: large numbers of outside workmen who may be ignorant of risks or the value of the collection, or careless, or both, are present; alarm or extinguishing systems may be temporarily, and sometimes perhaps, unwittingly, out of service. With an enormously valuable and irreplaceable collection such as the Newberry's at stake, extremely careful planning of fire protection during the building period should be undertaken, including possibly a staff member as a fire marshall, with sufficient time to keep constantly alert to any hazardous conditions.[30]

Water and steam piping should be kept out of book storage areas as much as possible. Although one obviously does not expect leaks in pipes they do occur, and not only in old buildings, as we have learned from the recent experience in the new Library Company of Philadelphia building.[31]

The Houghton Library at Harvard, and I believe also the Beinecke Library at Yale, have copper gutters under all water piping which might affect book storage areas.



Instruments for monitoring the environment in which books are stored: (from left) recording hygrothermograph, which gives a continuous temperature and humidity graph for a week; photographic exposure meter, which will give a rough idea of light intensities; and an aspirating psychrometer, which gives a precise reading of relative humidity

Having the heating and air-conditioning systems as well isolated from book storage areas as possible—perhaps in a separate building—is highly desirable from a conservation viewpoint.

Monitoring Systems

Various types of building systems are designed by highly specialized and, one must assume, usually highly competent, engineers. However, once the systems have been designed, installed, and perhaps given an initial shaking down, the specialized engineers are no longer involved in their continued proper functioning. The day-to-day operations and maintenance of these systems are normally turned over to a general building engineer or maintenance man, or even placed under the supervision of different departments within the library. The idea, then, is that the quality of the monitoring of the long-term functioning of systems is often not of the same calibre as the design of the systems in the first place. A notable example of this is the story that valuable material was stolen from an exhibit case, the new burglar alarm system for which had never been hooked up.

I would like to propose the general notion that all building systems should have as good monitoring as possible to ensure that the systems function as well as they were designed to, even long after they were installed, and the original engineers have forgotten about them. The monitoring systems should probably have centralized read-out and be continuous, and some of them might perhaps usefully be automatically recorded.

The Full-time Conservator

I have discussed elsewhere my reasons for believing that a research library of any size needs to have a full-time conservator who has sufficient rank to be able to influence library policy insofar as it affects the preservation of the library's collections.[32] I believe that the matters discussed in this paper further my argument, particularly since conservation crosses so many departmental lines. In the matter of monitoring environmental conditions especially, there is much virtue in having the monitor independent of the maintenance or buildings-and-grounds department which controls the environmental systems. That we do not yet have facilities for training conservators in the library field does not disprove the need for them.

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Emergency Building Temperature Restrictions

In a message to Congress (H. Doc. 96-162) on July 10, President Carter proclaimed that "a severe energy supply interruption currently exists" and put into effect his Standby Energy Conservation Contingency Plan No. 2 as of July 16 for a period of nine months. Final regulations governing emergency building temperature restrictions were included in the presidential message and in the July 5 Federal Register (pp. 39354-69). The effective date of July 16 is also announced in the July 16 Federal Register (p. 41205).

For nonresidential buildings the plan mandates thermostat settings of 65°F maximum for heating and 78°F minimum for cooling except to lower the room dew-point temperature to 65°F. The cooling and dew-point temperature restrictions have been relaxed slightly from the 80°F and 67°F originally proposed. ("Dew-point temperature" means the temperature at which condensation of water vapor begins as the temperature of the air-vapor mixture is reduced.)

General exemptions to these restrictions are available to prevent damage to special equipment as specified in service manuals, equipment service contracts or manufacturers' warranties; and where special environmental conditions are required to protect essential materials. ALA was among many organizations and individuals protesting the potential damage to library materials posed by the earlier proposed regulations. (See ALA statement attached to this newsletter.) In response, the introduction to the final regulations states:

> Comments were received from museums, libraries, art preservation associations and archival institutions strongly urging exemption from the heating and cooling restrictions where necessary to protect museum collections, library and archival collections and historical collections and structures. An express exemption has not been included, since Sec. 490.31(a)(4), which provides for exemptions where special environmental conditions are required to protect "materials", is intended to make available exemptions when necessary to preserve such collections and structures.

Such an exemption is deemed effective when claimed. If the nature of the collections or local environmental conditions make such an exemption necessary, the librarian should provide the following information to the owner or operator of the building: (1) the nature of the exemption and the section of the regulations claimed as the basis for exemption; (2) the portion of the building for which the exemption is claimed; and (3) the required temperature levels in the exempt portion of the building consistent with maximum energy savings.

Within 30 days of July 16, building owners or operators are to post a "Certificate of Building Compliance" setting forth any exemptions claimed, and to return a "Building Compliance Information Form" to the Department of Energy. After the 30-day period, building inspectors will be making visits and may issue violation notices. Building owners or operators will have 10 business days to reply. Informal conference and appeal procedures are available, but willful violators may be subject to a $10,000 fine and criminal prosecution.

The regulations are flexible concerning variations within a building and concerning specific types of heating, cooling and ventilating systems. Librarians or bulding operators are urged to consult the regulations. Compliance kits including the regulations, compliance forms and instructions, will be available by the end of July from: Director, Office of Building & Community Systems, Office of Conservation and Solar Applications, 20 Massachusetts Ave., N.W., Room 2221C, Washington, D.C. 20585 (202/252-4950).

To document an exemption to protect library materials, Department of Energy officials suggested that any generally accepted standard in the library and archival community would be sufficient. As a preliminary aid, the ALA statement on the proposed regulations is attached to this newsletter. It provides some guidance on the optimum conditions necessary to prolong the life of library materials.

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June 21, 1979

Ms. Margaret Sibley
Office of Conservation and Solar Applications
Department of Energy
20 Massachusetts Avenue, N. W., Room 2221C
Washington, D. C. 20585

Dear Ms. Sibley:

This letter is sent in response to the notice of proposed rulemaking to implement emergency building temperature restrictions as published in the June 1 Federal Register (pp. 31922-30). The American Library Association, representing over 35,000 libraries, librarians and other citizens dedicated to the improvement of library services, wishes to bring to your attention the effect of the proposed regulations on libraries.

The proposed regulations would implement the President's Standby Conservation Plan No. 2, Emergency Building Temperature Restrictions, and are expected to be put into effect very shortly after the final regulations are issued. For nonresidential buildings the plan mandates thermostat settings of 65°F maximum for heating, and 80°F minimum for cooling except to lower the room dew-point temperature to 67°F. Available exemptions would include: where required to prevent damage to special equipment, and where special environmental conditions are required to protect essential materials or processes. Enforcement would be by self-certification, but violations may be subject to a Violation Order, a Consent Order, or court action.

For most libraries, the 65°F maximum for heating would not be a major problem. However, the upper temperature and humidity limits proposed would cause serious problems with computer installations in libraries, and with preservation of library materials. We assume that computers and related equipment would be covered by the special equipment exemption, and we assume further that preservation of library collections would be covered by the "special environmental conditions' exemption. Because the problem of preservation of library materials is widespread and severe, but not always widely recognized, we request that libraries and archives be added as specific examples along with museums and art galleries in the explanation of Section 490.31(a)(4) which would exempt spaces where special environmental conditions are required to protect essential materials or processes.

Library conservation experts generally agree that the most significant step a library or archives can take to preserve its collection is installation of positive temperature and humidity controls which maintain a constant temperature of 65°F - 60°F and 45-50 percent relative humidity. Variations of more than 10°F and 15 percent relative humidity over a period of time are especially damaging; thus conditions must be maintained even during unoccupied periods.

The upper temperature suggested in the proposed regulation, 80°F, will exacerbate the already serious acid deterioration acting on all library materials, and, combined with high humidity, will be conducive to damaging mold growth. Scientific testing suggests that useful book life is doubled with each decrease of 10°F in storage temperature. If the upper temperature limitation is increased from 70°F to 80°F, this will halve the useful life of materials. The upper temperatures and humidity levels will also be damaging to microforms and audiovisual materials.

Libraries very widely in size, scope of collection and type of use, and each would have to decide individually whether such an exemption would be necessary based on these and other relevant factors, including perhaps local climatic conditions. For instance, Winthrop College in Rock Hill, South Carolina implemented a campus-wide energy conservation plan with restrictions similar to the proposed regulations. In warm weather, the result for the college library was a growth of mildew throughout the book collection. This is an expensive and difficult problem to treat; the best cure is prevention. In this case the relative humidity had to be reduced to about 40 percent before the problem became manageable.

In summary, we request that libraries and archives be specifically mentioned as examples of spaces "where special environmental conditions are required to protect animal or plant life or materials or processes, essential to the operation of a business within a covered building" in Section 490.31(a)(4) under "Exemptions" in the final regulations for emergency building temperature restrictions.

We appreciate the opportunity to comment on the proposed regulations, and appreciate your consideration.

Sincerely,

Eileen D. Cooke
Director
ALA Washington Office

EDC/pm

SOLINET

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ENVIRONMENTAL SPECIFICATIONS FOR THE STORAGE OF LIBRARY & ARCHIVAL MATERIALS

INTRODUCTION

Books, papers, and other items in library and archival collections are made up of a variety of components. The useful life of these materials is determined by the inherent characteristics of these components and by the environment in which they are housed. Paper manufactured since the middle of the nineteenth century is highly acidic and thus subject to rapid deterioration. Strict environmental controls are necessary to slow the rate of deterioration, since the useful life of documentary materials is significantly affected by the levels of temperature, relative humidity, light, and air pollution under which they are stored. It is also very important to avoid fluctuations in levels of temperature and relative humidity. More important than the need to maintain any specific level of temperature and relative humidity is the need to maintain constant levels. Environmental conditions for documentary materials in storage (separate from areas used by patrons) can and should be maintained at more stringent levels than for materials stored in areas used by people.

In addition to maintaining the environmental standards specified below, library and archive buildings must be equipped with smoke and heat detectors connected to a central fire alarm system off-site to guard against destruction of collections by fire.

TEMPERATURE

Most of the deterioration of library and archival resources is chemical in nature, and heat speeds the rate of the chemical reactions that damage these resources. For example, in a controlled laboratory setting it has been shown that the deterioration rate of cellulose (the main component of paper) is increased 2.5 times as temperature is increased from 68 to 70 degrees Fahrenheit. Heat also encourages biological agents, such as insects and mold, and directly affects relative humidity. Organic materials do not have a high degree of thermal expansivity, but variations in heat affect relative humidity, and fluctuations in relative humidity do cause structural damage to paper-based materials. Over time, fluctuations in temperature and relative humidity literally pull books from their bindings; such fluctuations should be eliminated. Fluctuations due to seasonal variations should be managed so that such changes are gradual. Rapid fluctuations do the most damage to collections. Therefore, it is recommended that repositories maintain the temperatures outlined below; if this is not possible, repositories can contribute to the longevity of their materials by maintaining constancy of temperature within the specified ranges.

Recommendations:

Contents	Temperature (degrees F)	Allowable Range (+ or -)
Books, Papers, & People	68	3
Books & Papers Alone	60	3
Photographic Materials	55	3
Books & Photographic Materials	60	3

RELATIVE HUMIDITY

A certain level of relative humidity is necessary for paper to retain its flexibility. But film and other photographic media require a lower level of relative humidity for optimum storage conditions. The various components which make up books and photographic materials have different rates of hygroexpansivity. Different materials stretch or shrink at differing rates in response to fluctuations in their moisture content, and this moisture content is directly related to the level of relative humidity in the surrounding air. Thus, the components which make up books will tend to fall apart, and photographic materials will tend to flake or peel away from their paper supports, with fluctuations in relative humidity. High humidity, like high temperature, accelerates the rate of chemical reactions and increases the rate of deterioration of library and archival materials.

All organic materials are hygroscopic; they take up and give off moisture in response to the percentage of moisture in the air. The equilibrium moisture content of most natural organic materials ranges from 3 to 20 percent. Cellulosic matural organic materials, because of their hygroscopic nature, act as buffers for fluctuations in relative humidity. Paper is quick to take up moisture from the surrounding air, but it releases moisture back into the air more slowly. Therefore, the measured relative humidity of the air may not be equal to the equilibrium moisture content of the books and papers stored in that air, especially if the materials are taken out of the building by patrons or staff members. Relative humidity is therefore only an approximation of the equilibrium of moisture content in paper materials. Because the moisture content of books and papers may be higher than that of the surrounding air, mold can grow on these materials even though the relative humidity measures within the accepted levels. Fluctuations in relative humidity contribute to the problem. Storage under constant conditions of relative humidity will slowly stabilize the equilibrium moisture content of books and papers.

The recommended level of relative humidity is a compromise among several requirements: (1) a level of moisture high enough to maintain flexibility, (2) a level low enough to slow deterioration of materials and to control insects and mold, and (3) a level which will do no structural harm to buildings due to condensation in cold weather. The important controlling factor in establishing an appropriate level of relative humidity is the need to maintain the relative humidity within a narrow range: plus or minus 5%. Maintaining humidity at a constant level is more important than attaining any one particular level.

Recommendations:

Contents	Relative Humidity	Allowable Range (+ or -)
Books and Papers	50%	5%
Photographic Materials	40%	5%
Books, Papers, and Photos	50%*	5%

(*This level may be reduced to 30-40% in winter to help prevent condensation)

AIR POLLUTION

Both gaseous and particulate air pollutants are harmful to documentary resources. Gases such as sulphur dioxide, oxides of nitrogens, and ozone are absorbed from the air into paper. These gases increase the rate of paper deterioration. Sulphur dioxide reacts with the moisture in paper to produce sulphurous acid which, in turn, reacts with oxygen in the presence of the metal ionic impurities in paper to produce sulphuric acid. This acid then breaks down the fiber structure of paper and causes embrittlement. Particulate pollution is made up of dust, ash, smoke, dirt, and mold spores. Particulate pollution causes abrasion, disfigures and obscures text, and adds acids, acid catalysts, and mold spores to paper materials.

Recommendations:

Gaseous pollutants can be safely filtered out of a respository's air by filters of activated, microporous, alumina impregnated with potassium permanganate. One brand name for this product is Pureafill. These pellets initially cost more than charcoal, but they last longer. Established standards for gaseous pollutants specify levels of **ten micrograms per cubic centimeter for sulphur dioxide and two micrograms per cubic centimeter for ozone.** Particulate filters which produce **filtering efficiencies of at least 60%** are a good compromise in air systems which recirculate 90% of the air. Very high efficiency filters such as Hepa filters are best suited to small, closed areas. These filters are generally too costly in price, energy consumed, and maintenance for use throughout library and archive buildings. **Electrostatic filtering is not recommended,** because electrostatic precipitators add the pollutant ozone to the air as they filter particulate matter.

Good air circulation is also important for the preservation of library and archival materials. Pockets of dead air should be eliminated, as these make regulation of relative humidity and temperature levels more difficult and promote the growth of biological agents, mold, and insects.

Rates of air exchange are set by building codes and are based upon the requirements of humans. Repositories usually have one air change per hour.

LIGHT

All wavelengths of light are damaging to library and archival materials. Ultraviolet light, which is not needed for seeing, is the most damaging. Light causes bindings, inks, and dyes to fade; darkens and yellows paper; and weakens cellulosic fibers through bleaching and oxidation. The damage caused by light is dependent upon the intensity, the kind of light, and the duration of exposure. Short exposure to a high level of light is as damaging as long exposure to a low level.

Recommendations:

Ultraviolet (UV) radiation should not exceed **75 microwatts per lumen** and is controlled by using incandescent lamps or fluorescent lamps which emit little or no UV, shielding fluorescent tubes and windows with UV filters, and using fixed window blinds or other forms of indirect lighting.

There is a clear difference between the UV output of cool white and warm white fluorescent lamps. Warm whites have less UV, and the difference is significant. But even warm white fluorescent lamps need to be filtered. The best lamps are those which emit no measurable UV at all, but these are much more expensive than standard tubes. These lamps are color-balanced so that they represent colors accurately. UV is so destructive that, especially for rare book rooms and display cases, the added costs for these are well justified.

All fluorescent lamps, both warm whites and cool whites, should be filtered. Fluorescent tubes should be filtered by a plastic covering on the light fixtures, not by use of sleeves over the tubes. This covering, called a lens, is more permanent than filtering sleeves and is less likely than sleeves to be lost when tubes are changed. Lenses should be made of UV-filtering acrylic. In display cases, the filter should be built into the case.

Daylight contains different kinds of light. Light from the sky (blue light) is higher in UV than light from the sun (yellow light). Reflected daylight is lower in UV than direct daylight since no surface, except snow, reflects UV. Thus, UV is most intense when it comes straight downward from a light source. **Direct sunlight and skylights should be avoided since they permit so much UV radiation.**

UV radiation can be reduced by **reflection** as well as by filtration. Window light should be directed away from books by blinds. The blinds should be set and locked in position so they cannot be changed. Indirect light is always lower in UV because UV does not reflect. Unfiltered fluorescent tubes can be used in libraries and archives if they are part of an indirect lighting system. Titanium white paint absorbs all UV radiation, so if light is directed at titanium white painted ceilings and walls, the reflected illumination will be free of UV regardless of the UV content of the source of the light. Ceiling tiles also absorb UV light.

The perceived brightness of light is, in part, a psychological function of the color of the light. Warm and cool white fluorescent lamps give off the same measured brightness. Warm whites are perceived as dimmer because of their warmer color. To feel comfortable, people often want bright light to be cool in color, and they want dim lights to be warm. One way to deal with the problem of perceived brightness would be to use filtered cool whites in reading rooms and work areas and filtered warm whites in stack and storage areas.

All light is damaging, so **lights should be turned off as much as possible** in the stacks. In a situation where study carrels or desks are located in the stacks, individual carrels should be illuminated by individual carrel lamps. The stack ranges should have timer switches or, at last, switches with signs that remind people to turn off the lights when they are not needed.

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Environmental Norms for Canadian Museums, Art Galleries and Archives

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Traitement des mots: Karen Kluz

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ABSTRACT

This Technical Bulletin presents a summary of the environmental norms applicable to Canadian Museums, Art Galleries and Archives.

INTRODUCTION

Environmental conditions within museums, art galleries and archives have a direct bearing on the preservation of their collection. The strict control of environmental parameters will effectively minimize the risk of damage to artifacts and works of art due to adverse conditions.

The Canadian Conservation Institute has published Technical Bulletins on specific environmental factors in order to help museum staff take the necessary steps to improve the conditions in their institution. The following environmental norms are extracted from these Bulletins and other publications in the field of conservation. They are drafted essentially for directors and curators who must deal directly with architects and building engineers, and are meant for Canadian climatic conditions. They apply to newly constructed buildings, additions to existing facilities, renovation to old buildings, installation of new climate control systems, and other relevant situations.

Institutions who are not contemplating changes to their existing facilities will also find these useful as a summary of recommended environmental requirements for light, temperature and relative humidity.

SECTION 1 - Temperature Requirements

1.1 The optimum temperature for exhibition and storage areas is 21°C, maintained year round with a daily fluctuation not to exceed ± 1.5°C.

1.2 The minimum acceptable temperature condition is a set point varying from 20°C to 25°C with a changeover rate of 1°C per month. The maximum permissible daily fluctuation is ± 1.5°C about the set point.

1.3 In many instances, the deterioration rate would be decreased at lower temperatures, however the human comfort factor necessitates temperatures not lower than 20°C and not above 25°C.

1.4 Consideration must be given to those materials having special temperature requirements. For example, fur garments, animal skins and similar artifacts are best stored in a cold storage kept at 4°C ± 1°C, at the proper R.H. (see section 2) and with sufficient air circulation.

SECTION 2 - Relative Humidity Requirements

2.1 The optimum relative humidity condition for exhibitions and storage is a constant condition year round with a set point between 47% and 53% RH, and with a daily fluctuation not to exceed ± 2%.

2.2 The minimum acceptable relative humidity set point for winter months is 38% and the maximum acceptable summer set point is 55%. Daily fluctuations should not exceed ± 3%. Occasional variations of as much as ± 5% are tolerable if these are the exception and not the rule. The set point changeover rate from winter to summer should be no faster than 5% per month.

2.3 These relative humidity levels are suitable for the majority of artifacts encountered in a typical collection. Again, certain categories of materials will necessitate conditions other than those specified above. For example, many metallic artifacts are less prone to corrosion if kept at lower humidities.

2.4 In order to maintain the high relative humidity levels required during the winter months, it is recommended that the building be maintained at a slightly negative pressure relative to the outdoors whenever pollution levels permit.

SECTION 3 - Structural Requirements

3.1 The exhibition area should ideally be free of windows and skylights unless these are U.V. filtered and, if necessary, coated or tinted to maintain the illumination levels required in paragraph 6.1. If the building is situated in an area where extremes in climate are common, then all its windows should be triple-glazed.

3.2 Wall construction should be of an appropriate design considering the relative humidity levels required in paragraphs 2.1 and 2.2 and the external winter conditions.

3.3 Insulation should be of a quality to prevent condensation on the interior surfaces.

SECTION 4 - Air Cleaning Requirements

4.1 The level of dust removal should be 95% of particles, 1 μm in diameter or larger and 50% of particles between 0.5 and 1 μm in diameter.

4.2 If unusually high levels of gaseous pollutants such as sulphur dioxide, nitrogen dioxide, ozone and hydrogen sulphide exist where the institution is located, some form of central air purification should be considered. Alternately, portable activated charcoal filters can be installed in problem areas. Electrostatic air purifiers and precipitators should not be used since they can produce ozone

4.3 The frequency of air changes and the amount of fresh air make-up should comply with any existing codes or regulations for public buildings. They should be such that the requirements in section 1 and 2 are achieved.

SECTION 5 - Recording Requirements

5.1 For central forced air systems, daily records should be kept of the return air temperature and relative humidity.

5.2 Portable thermohygrographs should be maintained in each exhibition and storage area of the building. Calibration should be checked every month using a motor-blown psychrometer or an electronic hygrometer. Sling psychrometers are not recommended.

5.3 In lieu of 5.2, a central electronic monitoring system can be utilized with RH and temperature sensors in each exhibition and storage area of the building. Periodic verification of this system is also necessary to ensure precise and reliable results.

SECTION 6 - Lighting Requirements

6.1 Light levels should not exceed 50 lux (5 foot-candles) on sensitive objects such as works of art on paper, parchment, textiles, watercolours, felt pen drawings and not exceed 150 lux (15 foot-candles) on paintings and polychromes. As much as 300 lux (30 foot-candles) is acceptable on insensitive objects such as most stone and bare metals. Areas other than the exhibition area can be illuminated at the discretion of the designer; however, it should be remembered that the public requires a gradual decrease in lighting in order to adjust to lower levels.

6.2 Both incandescent and fluorescent lighting systems can be used. The ultravoilet radiation emitted by fluorescent lamps should not exceed 75 µwatts/lumen; otherwise a U.V. filter sleeve or a U.V. absorbing diffuser will be required. In order to minimize colour distortion, fluorescent lamps should have a colour-rendering index of at least 85.

6.3 High pressure mercury and sodium lamps should not be used in exhibition and storage areas of museums, art galleries and archives because of poor colour-rendering properties and/or high ultravoilet radiation emission.

SECTION 7 - Special Considerations

7.1 The actual move of artifacts to a new climate-controlled facility should be planned very carefully. If the environmental conditions of the old facilities are much different than those recommended in sections 1 and 2, it may be necessary to adjust the control settings of the new facility to the levels at which the artifacts had previously been accustomed. They should then be changed gradually to the recommended values so that the artifacts can acclimatize slowly to the new conditions. The rate of change can be as much as ± 5% R.H. and ± 2°C per week depending on the sensitivity of the collection.

7.2 If possible, display cases should be lit from the outside to avoid heat build-up within. If lamps are located inside a case, they should be sealed off from the rest of the case and well-ventilated.

Technical Bulletin 1

Relative Humidity: Its Importance, Measurement and Control in Museums

K.J. Macleod

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Abstract

Moisture in the atmosphere plays a substantial role in the deterioration of works of art and museum objects. In this bulletin the relative humidity or RH, a measure of the moisture content of air, is described and the part it plays, sometimes in conjunction with atmospheric pollutants, is discussed in terms of the cracking and flaking of paint layers, the shrinking of wood, the cockling of parchment and paper, the corrosion of metal, the growth of moulds and fungi, etc.

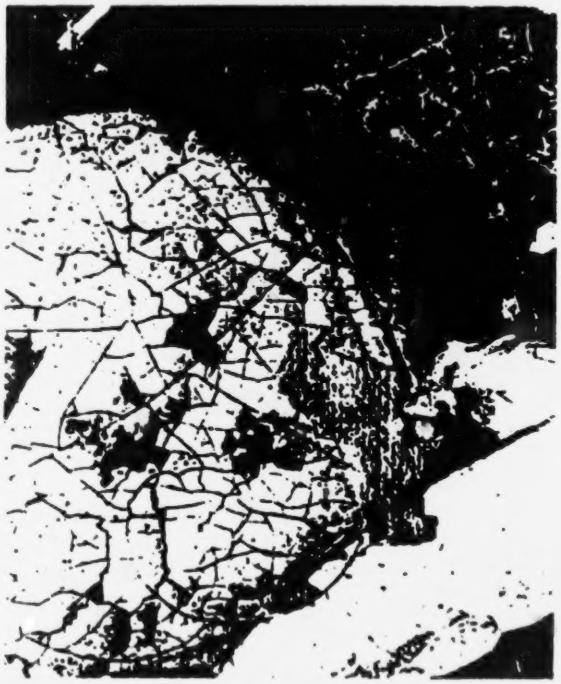
A range of acceptable RH values is suggested for museums. Some of the equipment available for monitoring relative humidity is described and the techniques available for controlling it are briefly discussed.

1. Introduction

The deterioration of works of art and museum objects starts at the time such things are made and proceeds through their lives. Iron objects rust (a special case of the more general problem of the corrosion of metals), paintings develop cracks and the paint layer may flake off, wood warps, paper cockles and discolours, both textiles and paper rot, leather decays, etc. Such deterioration is natural in the sense that it is the response by which such artifacts attain a state of physical and chemical equilibrium with their immediate environment. For example, the natural or equilibrium state of iron in the atmosphere is as the oxide of which rust is composed. Thus, in time all iron artifacts must turn to rust, but this tendency becomes rapid when the atmospheric moisture content increases. Porous materials such as wood, when brought from a dry to a humid atmosphere will adsorb water vapour and swell until a new equilibrium is reached.

Our modern industrial environment contains substantial amounts of sulphur dioxide which is evolved in the production of many metals from their ores and in the burning of fuels such as coal and oil. In the presence of air and water the sulphur dioxide forms sulphuric acid. Where materials known as catalysts are present this formation of sulphuric acid is greatly speeded up; iron salts and oxides function as catalysts for this reaction. The sulphuric acid formed will cause the deterioration of most materials. Paper will discolour and become brittle; the long molecules, of which fibrous materials such as papers and textiles are composed, are broken under the action of the acid and the material loses its strength; leather will become weak and powdery; marble is transformed and may disintegrate in the process. In the presence of light many other degradation reactions are initiated.

Humidity fluctuation can be especially damaging to composite objects. For example, the wooden supports of panel



Damage to painting resulting from improper humidity control. The initial cracking of the paint film has led to its lifting and the eventual loss of paint. NCRL study collection. The National Gallery of Canada, Ottawa.

paintings alternately swell and contract as the relative humidity of the atmosphere increases and decreases. This movement cannot be accommodated by the paint film (particularly by older more brittle films) and the paint will crack and eventually flake off.

Biological processes are also influenced by RH. One such problem associated with excessive humidity is mould growth. Fungi thrive in damp atmospheres and under such conditions mildew will form rapidly on materials, such as leather, paper, textiles, from which they can obtain nourishment. Their presence may result in staining of such materials and in extreme cases destruction of the object.

These are only a few of many examples that could be given to illustrate the influence that moisture in the atmosphere, either alone or in conjunction with light or with other atmospheric constituents, may exert on the deterioration of a wide range of artifacts. Before proceeding further, however, it is necessary to define more precisely what we mean by humidity and examine the concept of relative humidity.

2. Definition of Relative Humidity

Imagine a volume of air, say one cubic foot or one cubic metre, at normal atmospheric pressure from which we will remove all of the water vapour dissolved in it. This might be done by greatly lowering the temperature and literally freezing out the water or by passing the unit volume of air over a drying agent (dessicant). The water so removed could then be weighed and we would know the concentration of water vapour, in terms of pounds per cubic foot or grams per cubic metre, in the original sample of air. This concentration is called the absolute humidity. The absolute humidity can also be expressed in terms of a unit weight of air: pounds water per pound of air or grams water per kilogram of air. This latter method of expressing the absolute humidity is common in much of the conservation literature as in Plenderleith and Philippot's article on museum climatology[1].

The types of deterioration which we have discussed do not correlate with the absolute humidity, however. It turns out that whether or not an artifact takes up or gives off moisture depends not so much on the absolute humidity as it does on the capacity of that air to hold additional moisture. That capacity unlike absolute humidity depends on the temperature of the air. It is therefore necessary to define a somewhat more complex concept which takes temperature into account, the relative humidity.

Consider a cubic metre of air in a closed container at a temperature of 20°C (68°F) and suppose this cubic metre of air contains 9 grams of water vapour; the absolute humidity is 9 g/m^3. Let us suppose we then open a tap and allow 3 grams of water to flow into the container, we will find that this water will all evaporate and the absolute humidity becomes $12 g/m^3$. If we had let 8 grams enter, all of it would also have evaporated (absolute humidity $17 g/m^3$) but if we had let more than 8 grams enter, only 8 grams would have evaporated and the rest would have remained liquid. For example, if we had added 10 grams of water, 8 grams would evaporate to give an absolute humidity of 17 grams per cubic metre and we would have a puddle with 2 grams of water at the bottom of the container. At 20°C air can hold only 17 grams of water vapour per cubic metre and there is no ordinary means by which we can add more than this amount of moisture. The air under these conditions is at its maximum absolute humidity and is said to be saturated.

The relative humidity (RH) is defined as the ratio, expressed as a percent, of the absolute humidity of sampled air to that of air saturated with water at the same temperature:

$$RH = \frac{\text{absolute humidity of sampled air} \times 100}{\text{absolute humidity of saturated air}}$$

For example, the relative humidity, or RH, of the air we started with in the example above was

$$\frac{9}{17} \times 100 = 53\%$$

After adding the 3 grams of water it would have been

$$\frac{12}{17} \times 100 = 71\% \text{ RH}$$

At saturation the relative humidity would, of course, be 100%. Table 1 gives some values of the absolute humidity for saturated air at different temperatures.

The amount of moisture that air can hold increases with increasing temperature.

TABLE 1

Absolute Humidity of Saturated Air at Different Temperatures

Temperature		Grams of water per cubic metre of air
°C	°F	
-50	-58	0.06
-40	-40	0.12
-30	-22	0.34
-20	-4	0.90
-10	14	2.1
-5	23	3.2
0	32	4.8
5	41	6.8
10	50	9.4
15	59	13.
20	68	17.
25	77	23.
30	86	30.
35	95	40.
40	104	51.

Absolute humidity values in column 3 were calculated from vapour pressure data given in the Handbook of Chemistry and Physics, 50th edition (The Chemical Rubber Company, Cleveland, Ohio, 1969).

Therefore, a given absolute humidity corresponds to a smaller relative humidity as the temperature of the air is increased. For example, let us consider the sample of air discussed above which contained 9 grams of moisture per cubic metre. We have seen that at 20°C it had a relative humidity of 53%. At 25°C (77°F), air can hold a maximum of 23 grams of water per cubic metre so that if we were to warm our sample of air from 20°C to 25°C the relative humidity would drop from 53% to

$$\frac{9}{23} \times 100 = 39\%$$

Continued increase in temperature would result in further lowering of the RH. Now we can see why indoor air in winter can have such a low relative humidity. The air out-of-doors might be at -20°C (-4°F) and even if the relative humidity is 100% the absolute humidity is only 0.9 grams per cubic metre. If then that air is taken indoors and heated to 20°C (68°F), the relative humidity will only be

$$\frac{0.9}{17} \times 100 = 5\%$$

Of course, the opposite can also happen so that if the temperature is lowered as it may be at night, the relative humidity will rise. Thus if a room is at 25°C (77°F) and the relative humidity is 80% the absolute humidity will be approximately 18 grams per cubic metre. Should the temperature drop to about 21°C (69.8°F) the relative humidity will rise to 100%. Should the temperature drop below 21°C, even slightly, the air will be unable to contain the entire 18 grams of water vapour per cubic metre and water will condense out in the form of a mist or droplets. Thus the temperature at which the RH is 100% is called the dew-point. Such condensation can be observed when you blow on a cool mirror. There is a danger that when an artifact is brought suddenly from a cool environment to a warm room that the air in its immediate vicinity will be cooled sufficiently that the relative humidity will reach 100% and moisture will condense on the surface of the artifact.

It should be noted that the absolute (and hence relative humidity) is almost totally insensitive to atmospheric pressure. One may, therefore, ignore the effect on RH of changing pressure such as during airplane transport of an object or its exhibition at a museum at high altitude. Changes in temperature, however, cannot be ignored.

3. Behaviour of Materials toward Humidity

Unlike the absolute humidity, the relative humidity can be correlated with the uptake of moisture by various substances. At a given RH wood, paper, leather, textiles etc., will attain an equilibrium, specific for each material, at which they will have a constant moisture content. In practice certain complexities referred to as "hysteresis effects"* should be considered but we shall ignore them here. If the relative humidity were to increase, the moisture content of the material would rise until a new equilibrium moisture content was reached after which the moisture content would again remain constant. On the other hand, if the relative humidity were to decrease, the moisture content of the artifact would also decrease down to a new equilibrium value. To illustrate this concept Figure 1 shows a graph of equilibrium moisture content versus relative humidity for a few textile fibres. Figure 1 illustrates the type of relationship (i.e. the general shape of the graph) that exists between equilibrium moisture content and relative humidity. It also illustrates that even among textiles there are differences between the amount of moisture which a particular fibre such as cotton will adsorb at a given relative humidity and that which another fibre such as nylon will adsorb at the same relative humidity. Different materials behave differently with respect to adsorption just as they differ with respect to other properties. Additional graphs could be made for other substances such as wood or leather which would be similar in shape but again would differ in actual amounts. Wood shows rather high adsorptions, not unlike the viscose rayon in Figure 1. On the other hand, plastics and metals show negligible adsorption even at the highest relative humidities. With these non-porous materials adsorption is restricted to the surface and, although the surface moisture can be sufficient at even 45 to 50% relative humidity to cause corrosion in the case of metals, it still represents a small percentage of the total weight of the object. These non-porous materials, therefore, show negligible dimensional changes as a result of changes in relative humidity. Rocks such as limestone may be porous but because of their nature they also show

---

*Hysteresis refers to the incomplete reversibility of adsorption curves. As one increases the RH the equilibrium moisture content increases. If one then begins to decrease the RH it is found that the equilibrium moisture content is higher for any given RH than it was during the period of increasing RH. The object does not quite return to its original state.

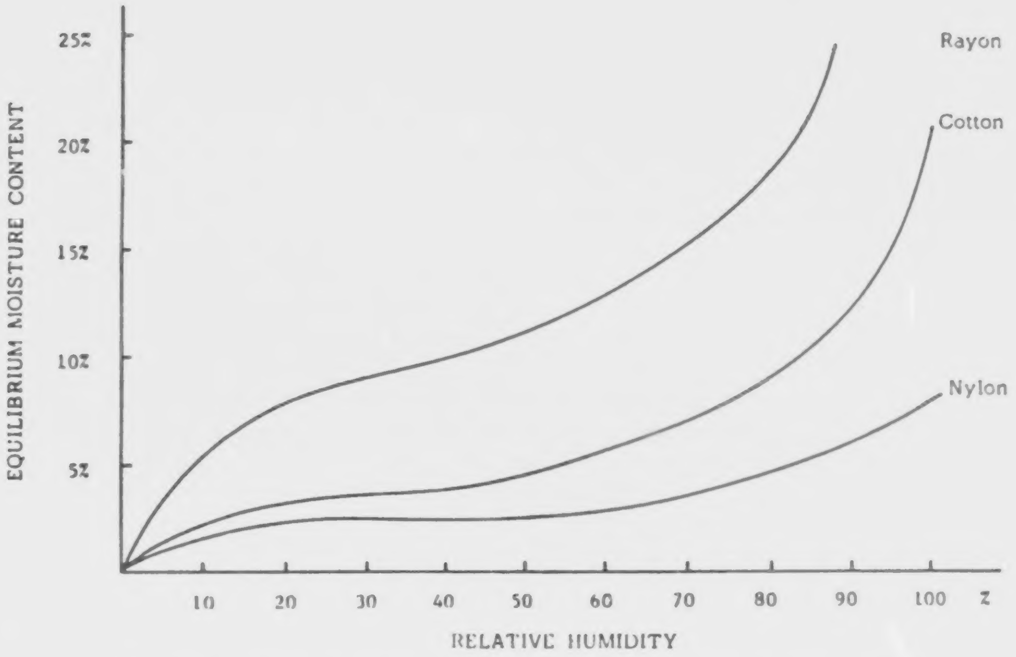


Figure 1 - Effect of relative humidity on the absorption of water vapour.

very little in the way of dimensional change as a result of high relative humidity but the freezing of water in the pores of such artifacts, as might happen if exhibited out-of-doors in winter, can cause spalling of the rock. So-called hygroscopic materials such as wood, paper, leather, textiles etc., swell as they take up moisture and shrink as they give up moisture, and pronounced dimensional changes can occur as such materials seek to attain their equilibrium moisture content in an environment with a changing relative humidity. It is these dimensional changes which give rise to the problems listed in the introduction.

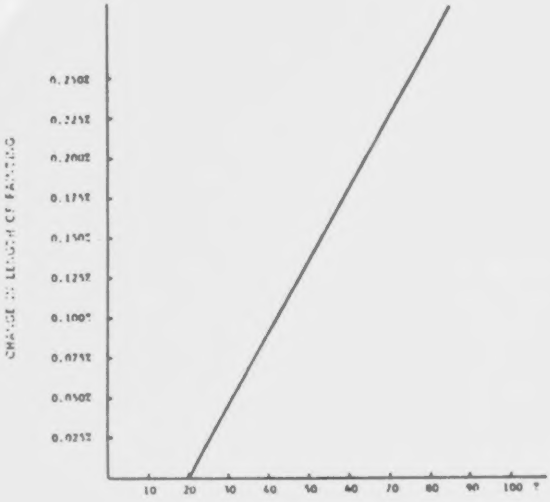
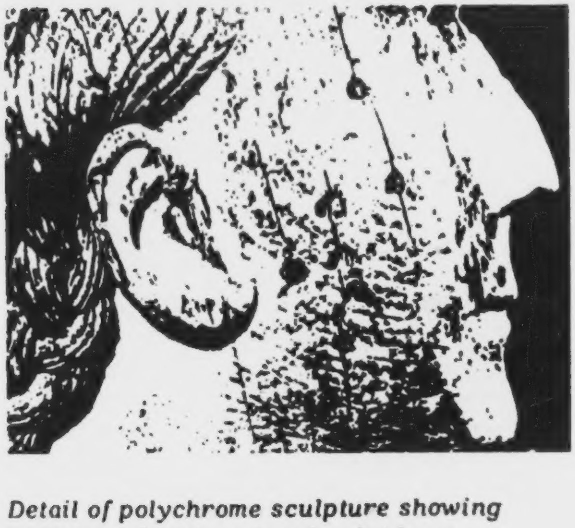


Figure 2 Change in length of an oil painting with change in the relative humidity.

The extent of dimensional changes with change in relative humidity is illustrated in Figure 2 which illustrates the changes in length of an oil painting that formed part of the exhibition, Progress in Conservation. The data does not represent equilibrium conditions.



Detail of polychrome sculpture showing splitting of the wood and paint loss. Collection Musée du Québec.

4. Optimum Relative Humidity Ranges

When we come to consider the best relative humidity at which to maintain a museum collection, it is necessary to consider the nature of the collection and the factors causing deterioration. Mould growth requires a high humidity. At temperatures between 16° and 25°C (60° and 75°F) it has been claimed that the propagation of mould requires a relative humidity in excess of 68%. We believe that even at 65% RH some mould species may propagate; this provides us with an upper tolerable level at which to maintain a museum RH. A practical upper limit is thus 65% relative humidity. Even at this level there is some risk of mould. If this value is exceeded a considerable risk of mould infestation is incurred; the more it is exceeded, and the larger the exposure, the greater the risk.

Another way of looking at the problem of setting acceptable RH ranges is to consider wooden artifacts. Such objects have likely been made from air seasoned wood and it is unlikely that such wood contained much less than 9 or 10% moisture at the time of fabrication. It may have, depending on the wood and on whether the object came from a particularly arid region, but the majority of wooden objects will have originally had at least 9 or 10% moisture. Ideally, a wooden object should be maintained throughout its life at a moisture content similar to that at the time of its fabrication because it is only at that condition that the joins and fitting of the parts will be exactly as the artisan intended. If we accept 9 or 10% moisture content as a reasonable lower limit for the original moisture content of most wooden artifacts then we should place a lower limit of about 45% on the relative humidity of museums since that RH corresponds to an equilibrium moisture content of 9 to 10% in wood. We are here suggesting a lower general limit and, in so doing, do not mean to imply that every wooden object should be kept in a 45% RH environment. There may well be specific objects in the collection that require particularly rigid humidity control at a different value because of their value and their particular history.

Considering the collection in isolation we have then arrived at a range of relative humidity values within which we should aim to maintain a general collection - i.e. between 45 and 65% RH. However, the available humidification equipment and the particular construction of the museum building may not permit one to maintain these conditions under the extremes of a Canadian climate. However, if the humidity cannot be controlled and it rises above 65% in summer and drops below 45% in winter, we may expect damage to occur to the artifacts. Even within the range 45 to 65% RH rapid variations can cause damage to particularly sensitive articles. The temperature should be maintained between 19 and 22°C (66° - 72°F). Plenderleith and Werner recommend an unvarying relative humidity of 58% at 17°C (63°F) for valuable easel paintings. Practicality however dictates that, for the general collection, we accept a range of relative humidity values and treat the ultra-sensitive article as an exception which can be provided for by such measures as a specially designed case in which a very constant relative humidity can be maintained. Even if the expensive air conditioning equipment were available to provide relative humidities in excess of 50% throughout the building, there are not many buildings in Canada that could survive such treatment through many winters. We therefore have to accept in most cases that the relative humidity in winter will be lower than in summer, but we should aim to keep it above 45% and we should try to ensure a gradual adjustment from summer to winter conditions and vice versa. Clearly the smaller we can keep the seasonal variation the safer will be the collection. Any daily variations should be much smaller than the seasonal variations. If even 45% RH is unattainable in midwinter because of the nature of the building then one may have to accept a lower minimum RH. If this is the case then one should similarly decrease the maximum permissible relative humidity. A range of 35 to 55% RH might be an acceptable compromise. The imperative is to keep the range of seasonal variations as small as possible.

5. The Measurement of Relative Humidity

In defining absolute humidity, we have suggested that air might be passed over a dessicant which would adsorb all of the moisture from a known volume of air and permit the moisture so adsorbed to be weighed. This would give us the absolute humidity averaged over the length of time required to make the measurement. Comparison with a table giving the absolute humidity at 100% RH for the temperature in question would permit calculation of the relative humidity. Although sound in theory the laboriousness of making measurements in this way renders it impractical for almost all purposes, an exception being certain scientific calibrations.

A. Dew-Point Hygrometers

As we cool air the relative humidity increases until a temperature (the dew point) is reached at which the air is saturated with moisture, (i.e. RH equals 100%) and liquid water just begins to condense out. The higher the initial relative humidity of the air, the less it will have to be cooled for condensation to occur. This principle can be used to devise an instrument for the measurement of relative humidity that is termed a dew-point hygrometer. Dew-point hygrometers consist of various mechanical devices for cooling a sample of air until condensation occurs and for measuring this dew-point temperature. By consulting tables or charts the relative humidity can be determined from the dew-point temperature for the particular environment from which the sample was taken. It is an instrument that, if well designed and in the hands of a skilled operator, will provide the very highest accuracy but it is not the type of instrument that would be routinely used in a museum or art gallery. Measurement is time-consuming and requires some considerable care and skill. Such dew-point hygrometers are meant for single determinations and cannot be readily adapted to situations requiring recording. On the other hand, the dew-point hygrometer requires a very small sample which may lend it to special situations as, for example, the measuring of the relative humidity within a confined volume such as the interior of a picture frame. A simple dew-point hygrometer could be purchased for less than $50, but more automated dew-point hygrometers are available which would overcome some of the limitations for routine use. For example, the Environmental Equipment Division of the EG and G Company has one employing thermoelectric sensing of the dew-point which costs about $1000. Somewhat less sophisticated are instruments marketed by scientific survey houses such as Canadian Laboratory Supplies for about $400. However, at these prices they are probably too expensive compared with psychrometers for most museum use.

B. Psychrometers

Psychrometers consist of two thermometers, not unlike the dew-point hygrometer in this respect. One measures the room temperature. The other is sheathed in cotton which must be kept moist. The moisture will evaporate and cool the thermometer below the indication on the dry bulb. If the environment is at 100% relative humidity, obviously no evaporation can occur and there will be no difference in the readings of the two thermometers. The drier the environment, the more rapidly the water will evaporate, the cooler the wet bulb will get and the greater will be the difference between the two thermometer readings. A chart or table is supplied by the instrument manufacturer relating this temperature difference to the relative humidity. An example is shown in Table 2. A complete table

TABLE 2

EXAMPLE OF A PSYCHROMETRIC TABLE

Relative Humidity Expressed as Per Cent for Centigrade Temperatures

Air temperature (t)	Depression of wet-bulb thermometer (t-t')														
Degrees Celsius	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5
0	98	96	94	93	91	89	87	85	83	81	80	78	76	74	73
1	98	97	95	93	92	90	88	86	85	83	81	80	78	76	75
2	98	97	95	93	92	90	89	87	85	84	82	81	79	78	76
3	98	97	95	94	92	91	89	88	86	84	83	82	80	78	77
4	99	97	96	94	93	91	90	88	87	85	84	82	81	79	78
5	99	97	96	94	93	91	90	88	87	86	84	83	82	80	79
6	99	97	96	94	93	92	90	89	88	86	85	84	82	81	80
7	99	97	96	95	93	92	91	89	88	87	86	84	83	82	80
8	99	97	96	95	94	92	91	90	88	87	86	85	84	82	81
9	99	98	96	95	94	93	91	90	89	88	87	85	84	83	82
10	99	98	96	95	94	93	91	90	89	88	87	86	84	83	82
11	99	98	97	95	94	93	92	91	90	89	87	86	85	84	83
12	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84
13	99	98	97	96	95	93	92	91	90	89	88	87	86	85	84
14	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
15	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
16	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85
17	99	98	97	96	95	94	93	92	91	90	89	89	88	87	86
18	99	98	97	96	95	94	93	92	92	91	90	89	88	87	86
19	99	98	97	96	95	95	94	93	92	91	90	89	88	87	87
20	99	98	97	96	96	95	94	93	92	91	90	89	89	88	87
21	99	98	97	97	96	95	94	93	92	91	90	90	89	88	87
22	99	98	97	97	96	95	94	93	92	92	91	90	89	88	87
23	99	98	97	97	96	95	94	93	93	92	91	90	89	89	88
24	99	98	98	97	96	95	94	94	93	92	91	90	90	89	88

is much larger and a person should use the one supplied by the instrument manufacturer.

Errors can occur in measurements made by a psychrometer as a result of differences in the evaporation rate from the wet bulb that are caused by small air movements. To avoid these difficulties, it is necessary to maintain an air flow over the bulbs in excess of a critical value. In the Assman-type psychrometer, this is accomplished by a small electrically driven fan. In the sling psychrometer, this is done by whirling the whole psychrometer assembly around a handle at a given rate and for a given period of time. The accuracy of a well constructed instrument of the Assman type is greater than those of the sling type but sling psychrometers are cheap. With a good Assman psychrometer, the relative humidity measurement can be accurate to within two units of percent.

Psychrometers are available which record the results on a continuous basis; they incorporate either strip or circular charts which simultaneously record both wet and dry bulb temperature.

As with any instrument, the results obtained will depend greatly on the care taken in its use; the manufacturer's recommendations should be carefully followed. In particular, attention must be given to the wicks or sheaths which should be closely fitted to the thermometer bulb, adequately wetted with distilled water and kept free of salts. Accurate readings of the temperature are required if the measured RH is to be accurate. As may be seen in Table 2, if the room temperature is 20°C, and one reads 1.4° as the difference between wet and dry bulb temperatures, the relative humidity is 88%. If 1.5° were read instead, the RH would be 87%. Thus a 0.1° error in determining the temperature difference will result in an error of one unit of percent in the RH measurement. Obviously, the thermometers must be precise and they must be read with care. A sling psychrometer can be purchased for under $25; Assman types cost about $100.

C. Hair Hygrometer

Probably the best known hygrometer is the hair hygrometer, versions of which are offered for sale in many department stores for home use. The principle behind their operation is, as we have seen earlier, that a hair, or bundle of hair fibres, will lengthen as the relative humidity increases and shorten as the relative humidity decreases. This change in the length of the hair is transmitted to a pointer or to a recorder pen.

Hair hygrometers are not as accurate as a psychrometer or a dew-point hygrometer and they may take up to one half hour to fully respond to a change in the relative humidity. However, they are cheap, they may be read directly in relative humidity and can be used by anyone. The usual measurements in a museum do not necessarily require great accuracy. We frequently want to know whether the museum atmosphere is within the acceptable RH range and the local variations within many museum buildings may well be as great as 10%. For such museums, the hair hygrometer may well be satisfactory providing it is used with respect for its limitations. It should be calibrated every month or so against a reliable dew-point instrument or a psychrometer. Hair hygrometers have their best accuracy in the range between 30 and 80% RH. The price of the simplest hair hygrometers is $10 or less.

D. Coloured Salts

Various cobalt salts such as cobalt thiocyanate have a colour that depends on the relative humidity. Paper that has been impregnated by such a salt can be placed in the environment under test. The colour, which varies from blue to pink, can be compared with standard colours to indicate the approximate relative humidity. They are not particularly accurate (certainly the relative humidity cannot be assessed to better than 5% by such a technique) and they do not lend themselves to measurements in large rooms. They are, however, inexpensive and can be used to advantage in confined cases.

E. Miscellaneous Hygrometers

There are hygrometers available based on other physical and chemical principles. The diffusion hygrometer depends on the pressure difference developed across a membrane on one side of which is a saturated atmosphere (obtained by partly filling the chamber with distilled water) and on the other side of which is the atmosphere under test. The greater the pressure difference, the lower the relative humidity.

The capacitance hygrometer incorporates a hygroscopic dielectric so that the capacitance which is monitored by an associted metre is a measure of the relative humidity.

Other hygrometers measure the resistance of a humidity-sensitive resistor.

F. General Considerations

The Canadian Conservation Institute will in the near future be issuing recommendations on specific environmental monitoring equipment. For the present, we will restrict ourselves to general observations. Every museum, no matter how small, should be able to afford simple hair hygrometers which can be purchased for $10 or less. In fact, for the price, a few could be purchased and placed in different locations. These will indicate large changes in the relative humidity between different parts of the building and between different periods of the year. To have confidence in the actual readings, these hair hygrometers must be calibrated against a good dew-point hygrometer or psychrometer. A Bendix "Psychron" psychrometer suitable for calibrating purposes can be purchased from Fisher Scientific Co., Limited, for less than $100. Unless one is prepared to make frequent observations with the simple hair hygrometers both during museum hours and outside of them, it will be impossible to discover certain cycling behavour in the RH. To do this conveniently, it is necessary to have a recording hygrograph. An instrument such as the thermohygrograph made by the R. Fuess Co. and sold by the Hughes-Owens Co. costs about $575. This instrument makes a continuous recording of both the temperature and the relative humidity over a 7-day period after which it is necessary to insert a new strip chart. This instrument, being of the hair type, should be calibrated against a "Psychron". Both Fisher Scientific and Hughes-Owens have outlets in many Canadian cities.

6. Methods for Controlling the Relative Humidity

In this section we will examine very quickly the type of equipment available for the control of relative humidity. It is not intended to be exhaustive but merely to give the curator an idea of what can be done. To do more would be to make this bulletin far too long and thus diminish its usefulness. Exhibition case design and museum air conditioning are topics that deserve their own bulletins and future publications from the Canadian Conservation Institute will undoubtedly include them.

The ultimate is a well designed central air conditioning system in which both temperature and relative humidity are rigidly controlled day and night, winter and summer. Systems to ensure adequate preservation of artifacts are more elaborate and expensive than those required just for human comfort. Over-dry air may have its humidity increased by passing it through a fine spray of water formed by nozzles or other mechanical means or by vaporizing water by heating. Over-humid air may be dehumidified by passing it over refrigerator coils which cool it and condense out the moisture or by passing the air through a bed of dessicant. The museum that can afford such a system will have to consult with a qualified engineer who can specify the exact requirements based on the external climate, the size and layout of the building, the quality of the water available, the way the building walls are constructed, the type of heating system, etc. Each building poses unique problems and a custom solution is required. The best solution will be achieved when it can be implemented during construction of the building or when the building can be modified to accommodate the needs of the air conditioning system. Once installed, the museum will need to employ a competent person to operate and maintain the system.

Only the more fortunate museums will be able to achieve the full environmental control that is implied in a properly designed air conditioning system. The smaller museum, however, may be able to install portable humidifiers to increase the low indoor relative humidity during the dry months of the Canadian winter. The wick-type portable humidifier will put only a few gallons of water per day into the room air and one would have to buy quite a few of them in order to do an adequate job of humidification. However, there are drum-type units retailing at less than $100 that will evaporate about 17 gallons per day. Portable dehumidifiers are also available retailing at about $150. These will remove, depending on the size, between 14 and 24 pints of water before the dessicant has to be regenerated. There are also mechanical units which remove a similar amount of water vapour by condensation; drains or trays are needed to collect the condensed water.

The number of units required will depend on a number of factors and will most readily be found by adding units until the desired humidity is achieved. It is extremely important that humidifiers and dehumidifiers be placed in storage areas; this is something that is often overlooked when cutting costs. In order to obtain satisfactory results windows should be sealed and doors kept closed. It is advisable to install automatic door closers; revolving exterior doors are also an advantage. To keep the relative humidity up in winter, avoid overheating the building. Keep the temperature as low as is comfortable, certainly below 22°C and preferably below 20°C. But above all keep the temperature and relative humidity constant. Do not let the temperature drop at night and rise during the day when the museum is open. Such daily variations can be very damaging and is therefore false economy. It is far better anyway to keep the temperature down both day and night.

In many buildings it is likely that an attempt to maintain a reasonable humidity in the interior during the coldest months of the year will lead to serious damage to the exterior walls of the building. This occurs because water vapour will diffuse through the wall from the region of high humidity inside to the low humidity atmosphere outside. In the colder regions within the wall the water vapour may condense and leach salts out of the wall. These show up on the exterior surface as a white discolouration or efflorescence. Freezing of the water or precipitation of salts within the wall can cause volume changes which shatter the brick or masonry and cause it to spall off. In the coldest periods it is quite possible for water vapour to condense even on the inside of an exterior wall with ultimate destruction of the plaster or gyproc. In the event of severe restrictions on the permissible RH levels in a building, it may, however, prove possible to house the more susceptible items of the collection in an interior room. One can then maintain the humidity of this room at the desired level, and, with an effective buffer zone of lower relative humidity between this room and the exterior walls, damage will be minimized or even prevented.

Collections will contain items whose value dictates exercise of the greatest care in their preservation. If the budget does not permit the control of the entire museum environment to the required degree, these items may be placed in sealed glass or Plexiglas cases, the environment of which can be so controlled. Silica gel can be preconditioned so that when it is kept within the case it will ensure that the desired relative humidity is maintained. (2) Preconditioned silica gel is by far the most convenient, but in its absence a saturated salt solution can be used. For aesthetic reasons, it may be desired to hide the silica gel or salt solution beneath a porous false bottom in the case. (3)

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1. H.J. Plenderleith and P. Philippot, 'Climatology and conservation in museums', Museum (Paris), xii, 4 (1960), 201-289.
2. For a discussion of case design see N. Stolow, 'Fundamental case design for humidity sensitive museum collections', Museum News (Washington), Technical Supplement No. 11, February 1966.
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Readers who wish to pursue the subject of hygrometry to a deeper level are recommended to consult the article by H.J. Plenderleith and P. Philippot and the work edited by A. Wexler. Some of the material covered in this present bulletin is presented more briefly in the other publications.

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Technical Bulletin No. 7

Fluorescent Lamps

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ABSTRACT

The operation and visual characteristics of fluorescent lamps are reviewed with special consideration given on how to choose the right lamp for a particular application. The ultraviolet radiation emission of some 114 fluorescent lamps was determined in the CCI laboratories and is reported here. The use of high colour rendering, low UV-emitting tubes is recommended for museums and art galleries.

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I. INTRODUCTION

The concern for the proper illumination of museums and art galleries is ever present in the mind of the conservator, who is only too aware of the potentially damaging effects of light and ultraviolet radiation on artifacts and works of art, and of the curator, who knows that the type of lighting will have a direct bearing on the acceptability of an exhibition. The possibility of achieving a balance between sound conservation practice and esthetical appearance exists. Unfortunately, those who are responsible for installing lighting systems in museums and art galleries are often not sufficiently knowledgeable in the proper design of such systems.

In the past, natural light was the predominant source of lighting for museums and art galleries, while artificial light was used only sparingly to complement the existing natural light. Nowadays, this trend has been almost totally reversed, certainly for Canadian institutions. (See Reference 1.) Although there is a slight preference for incandescent lamps, the use of fluorescent tubes is widespread. The basic construction, operation and visual characteristics of fluorescent lamps differ significantly from that of the incandescent bulb. The only similarity existing between the two is that they both produce visible light. Whereas the quality and general appearance of the light emitted by incandescent lamps varies little from one type of bulb to the other, drastic differences exist within fluorescent lamps. The ignorance of these differences and why they occur can lead to lighting conditions that can be damaging to artifacts and works of art, while at the same time creating an esthetically unpleasant ambiance and mood in an exhibition.

II. OPERATION OF FLUORESCENT LAMPS

Most fluorescent lamps are made with tubular glass bulbs varying in diameter from 5/8 inches (T-5) to 2 1/8 inches (T-17), and in over-all length from six to 96 inches. They are available in various wattages from four to 215 watts. The standard designation for fluorescent lamps is explained in Figure 1.

The popular 4-foot, 40-watts tubes are normally designated simply as F40CW, F40WW, F40D, etc., without the shape and diameter of the bulb.

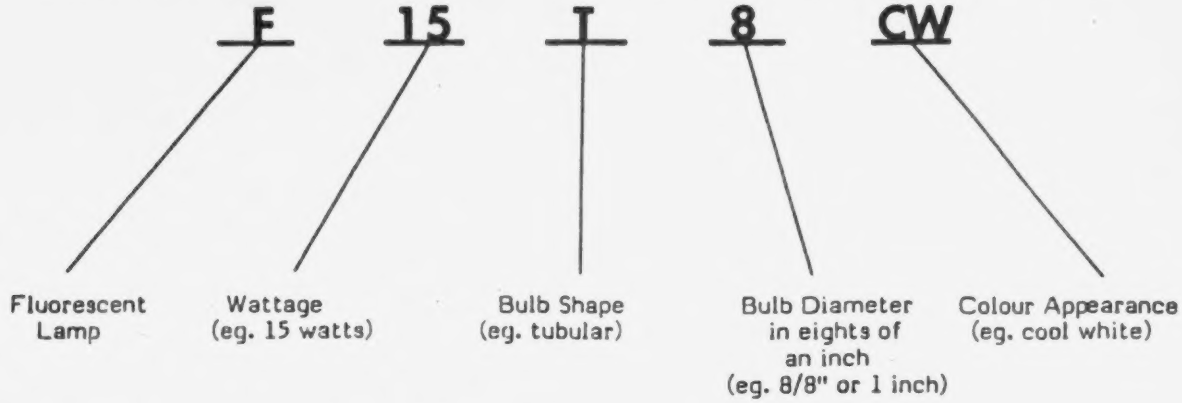
F
15
T
8
CW
Fluorescent Lamp
Wattage (eg. 15 watts)
Bulb Shape (eg. tubular)
Bulb Diameter in eights of an inch (eg. 8/8" or 1 inch)
Colour Appearance (eg. cool white)

Figure 1: Standard Designation for Fluorescent Lamps

A schematic diagram of a typical fluorescent lamp is presented in Figure 2. Two electrodes are hermetically sealed into the bulb, one at each end. A small amount of mercury is contained in the tube together with a rare gas to facilitate ignition of the discharge. The light-emitting process proceeds in the following way: When a current is applied to the electrodes, a flow of electrons is generated from one electrode (the cathode) to the other (the anode). During their path, these electrons will collide with the atoms of mercury present in the tube and impart some of their energy to them, thus forming electronically excited atoms of mercury. After collision, the electron will continue along the tube to excite one or more additional mercury atoms and finally end up on the wall of the tube or collected at the anode.

The excited mercury atoms thus formed release the absorbed energy by emitting electromagnetic radiation (mostly UV) at very specific wavelengths. The main emission occurs at 253.7 nanometers in the ultraviolet region. Weaker emissions occur at about 313, 334, 365, 405, 436, 546 and 578 nanometers and are the so-called mercury lines typical of a fluorescent lamp's spectral distribution curve. The UV radiation produced (at 253.7 nm) will strike the interior wall of the tube which has been previously coated during manufacturing with substances known as phosphors. These phosphors will absorb this energy and release it as visible light. Each particular phosphor has a characteristic fluorescent band, some emitting blue-green light, others pink, etc. (See Reference 2). The selective combination of phosphors will determine the colour appearance of a lamp. Thus, a manufacturer has much flexibility in determining the spectral distribution of a given lamp type simply by selecting the proper blend of phosphors.

The spectral power distribution curve of a typical cool white fluorescent lamp is given in Figure 3. The mercury emission lines, often illustrated as bars instead of lines, are due to the energy released by the activated mercury atoms. The strongest line at 253.7 will activate the phosphors which then produce the continuum of visible light and some UV. The glass envelope will absorb any UV below about 320 nm which manages to go through the phosphor unabsorbed. The visible light continuum in this example would seem to be produced by two different phosphors.

Four different visual properties will be directly affected by the phosphor blend: the correlated colour temperature (C.C.T.), the colour rendering index (C.R.I.), the ultraviolet radiation emission and the lumen output.

Although these have been discussed before in other publications (See References 3 - 6), new technology and improvements in lamp manufacturing warrants an up-to-date survey of fluorescent lamps on the market. Each characteristic will be dealt with separately.

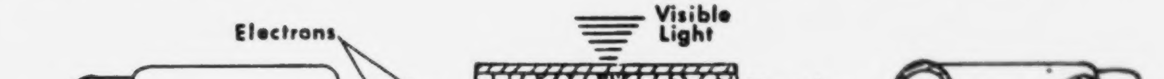

Figure 2: Schematic representation of a typical fluorescent lamp.

A basic understanding of light and its properties is necessary to comprehend fully the intent of this exposé. We would hope that the reader has previously read CCI's Technical Bulletin No. 2 on Museum Lighting by K.J. Macleod. (See Reference 7).

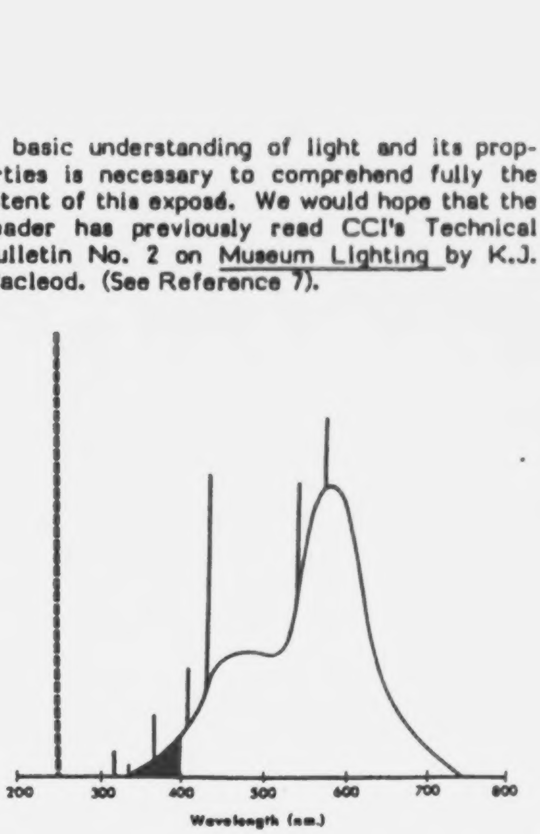

Figure 3: Spectral Energy Distribution of a Typical Fluorescent Lamp.

III. CORRELATED COLOUR TEMPERATURE

The correlated colour temperature (C.C.T.) of a light source is a value used to characterize the spectral distribution curve of that source and hence its colour appearance. For example, a light source with a C.C.T. of 3000°K is the same colour as a theoretical black body radiator whose temperature is 3000°K. Perfect white light - i.e., light containing approximately equal amounts of all colours - has a C.C.T. of about 5500°K. Below this value, there is a proportional increase in the yellow, orange and red region of the spectrum and the light appears progressively yellower. Above 5500°K, the blue/violet region is increased and the light appears blue; the higher the C.C.T., the bluer the light gets.

Unlike incandescent lamps, fluorescent tubes are available in a variety of "whites" or colour temperatures. The reader is certainly familiar with the three main categories of fluorescent lamps. The so-called warm white tubes have typical C.C.T.'s of 2700 to 3100°K and give off a yellowish white light similar to incandescent bulbs. The daylight lamps whose C.C.T. is 6000°K or more have a bluish cast and are used to compliment natural daylight. Somewhere in between at about 4200°K is the popular cool white, used extensively in office lighting. Other than the three main groups, there exists other fluorescent lamps of various colour temperatures; e.g., natural white, supermarket white, colour-matching, etc. These are normally produced for specific applications where the appearance of certain materials is improved by a particular colour temperature. Such lamps can be well suited for other situations and one should not be misled by the name.

The colour of an object will appear different under a warm illumination (low C.C.T.) than it would under a cool illumination (high C.C.T.). Fortunately, the human eye has an adaptive mechanism which will psychologically correct for these differences. The incandescent light bulbs which illuminate your house give off essentially white light. When you are outside, the illumination provided by the combination of sunlight and daylight again appears white. Yet, when you compare the two directly, one is definitely yellowish, the other quite blue (daylight). One is not mentally aware of this difference until the direct comparison is made.

Certain considerations must be taken into account when deciding what colour temperature one should use for a particular exhibition. If a room is also lit by incandescent bulbs and the fluorescent lamps are used to compliment the existing lighting, then a warm white (C.C.T. < 3200°K) could be used to avoid the unpleasant contrast between the two types of lamps. If, on the other hand, there are many windows or skylights in the room, a daylight fluorescent lamp (C.C.T. > 5000°K) would be more appropriate.

For exhibits depicting outside scenes or for artifacts normally seen outdoors, the use of daylight fluorescent lamps can create a more natural and pleasant mood. There exists, however, a psychological preference for a warmer illumination when light levels are low. For light sensitive objects kept at 50 lux, a warm illumination will be much more pleasant than a cool one.

Needless to say, personal preference plays a big part in the final choice of colour temperature. The best approach would be to try out various types to see which one creates the most pleasing effects.

IV. COLOUR RENDERING INDEX

The spectral energy distribution of most light sources do not match perfectly that of a black-body radiator, even though they may appear to have the same colour. The extent of this difference is described quantitatively by the colour rendering index (C.R.I.). A maximum value of 100 is assigned to a light source whose spectral energy distribution matches that of a black-body radiator of the same colour temperature. If their spectral output do not match, then the C.R.I. of that source is less than 100; the larger the mismatch, the lower the C.R.I. becomes. The actual calculation of the colour rendering index of a source involves the evaluation of the colour appearance of eight standard colours under the light in question, as compared to a theoretical black-body radiator of the same colour temperature.

It is important to realize that two lamps can have the same correlated colour temperatures but drastically different colour rendering indices. In such cases, the two lamps would have the same colour, yet objects would appear different from one to the other. Figure 4 compares two cool white fluorescent lamps with a black-body radiator of the same colour temperature. One of the lamps has a low C.R.I.; the other, quite high.

Unfortunately, the human eye has no adaptive mechanism to correct for these colour differences as it does for colour temperature variations. Colours are said to be rendered normally under light sources having a C.R.I. of 100. Anything less can create colour distortion; this becomes more pronounced for very low C.R.I.'s. No doubt you have experienced this type of colour distortion at some point in your life. The most common example is in covered parking lots where mercury or sodium lamps provide the illumination. In these situations, the colour of your car or clothing takes on a peculiar shade due to the poor colour rendering properties of the lamps.

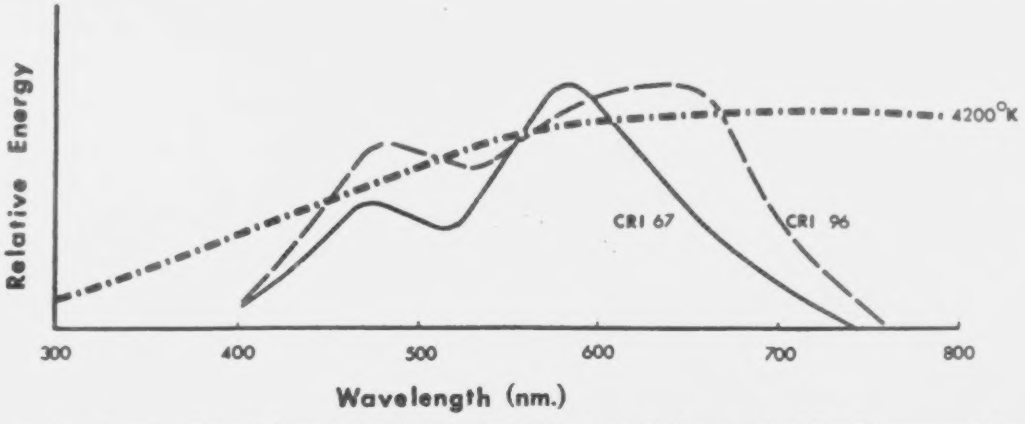

Figure 4: Comparison between good and poor colour rendering cool white fluorescent lamps.

In general, light sources whose C.R.I. is above 85 will render colours well: any colour distortion would be so small that it would be undetectable to the human eye.

Since colour appreciation is of utmost importance in museums and art galleries, serious consideration must be placed on the colour rendering indices of lamps. Incandescent lamps have very high C.R.I.'s and cause no problems. Fluorescent lamps, on the other hand, can have varying colour rendering properties; thus it becomes important to consider this aspect of illumination. A minimum acceptable C.R.I. is difficult to establish precisely; as a rule of thumb, a lower limit of about 85 can be arbitrarily chosen.

Normal versions of fluorescent lamps now produced have poor colour rendering properties (e.g., ordinary cool white has a C.R.I. of about 65). One would immediately wonder why such lamps are produced. Unfortunately, good colour rendering is often achieved at the expense of lumen output. Fluorescent lamps of high C.R.I. emit less light per watt of electricity than those of low C.R.I. (sometimes as much as 45% less light). High energy costs make the normal cool whites, warm whites and daylight tubes more popular than their deluxe and special deluxe counterparts. For museum and art galleries, the reduced light output may actually be a blessing in disguise since lighting levels are on the average much higher than the recommended values.

V. ULTRAVIOLET RADIATION EMISSION

In the museum world, the fluorescent lamp has always been associated with excessive ultraviolet radiation emission. The UV is produced by the excited mercury atoms - the so-called mercury lines - and by the phosphors whose emission bands can tail off into the UV region. Little can be done to reduce the strength of the mercury lines, but the judicious choice of phosphors can significantly reduce the quantity of UV given off as part of the light continuum.

To a lamp manufacturer, any UV radiation emitted by the phosphors is essentially wasted energy since it contributes nothing to seeing. There are fluorescent lamps now on the market that emit considerably less UV than before. Most lamp manufacturers offer specially designed low UV emitting lamps for situations where photochemical deterioration is of some concern, such as in clothing and departments stores and, of course, in museums and art galleries. In one case, this is achieved by applying a UV absorbing coating to the lamp at the time of manufacturing.

Most manufacturers' information sheets or catalogues give very little information on the actual quantity of UV given off by fluorescent lamps. They will sometimes provide spectral distribution curves for various lamps or some indication that UV is low or high, as in the case of sunlight simulating lamps Unfortunately, this information means little to the curator of a museum who is faced with the task of purchasing fluorescent lamps for his institution.

A simple yet effective means of assessing the suitability of a lamp in terms of its ultraviolet radiation emission is to determine the proportion of UV emitted per unit of visible light. The unit of measurement is most commonly µwatt/lumen. A small device known as the Crawford UV Monitor Type 760 is now available for carrying out these measurements. (See Reference 8). Incandescent bulbs normally emit less than 75 µwatts/lumen of UV, whereas sunlight is composed of about 400 µwatts/lumen of UV

For museum and art gallery applications, light sources should emit less than 75 µwatts/lumen; otherwise, UV absorbing filters should be used. Unfortunately, most museums cannot afford to purchase a UV monitor such as the one mentioned above. For this reason, the authors have carried out the UV measurement of most fluorescent lamps available on the market today. These values are reported in Table 1, along with manufacturers' information on colour temperature, the colour rendering index and lumen output.

For this study, 72 types of 40-watt (F40T12) and 42 types of 15-watt (F15T8) tubular fluorescent lamps were purchased from manufacturers and tested as received without prior aging. This would represent the maximum achievable UV output of a given lamp since UV emission (and also lumen output) diminishes with time. (See Reference 9).

Standard fluorescent fixtures were mounted on a dark room wall and used without diffusers. To eliminate errors due to surface reflectance, all walls and the ceiling of the dark room had previously been painted black.

Three Crawford Type 760 UV monitors, previously calibrated against a standard light source, were used to measure the UV output of each lamp in μwatts/lumen. Measurements were taken from a distance of three feet by directing the monitor at the central portion of the lamp. One reading from each monitor was taken for two or three replicates of each different type of lamp.

Before testing, each lamp underwent a ten-minute warm-up time to permit a stable operating temperature to be attained. Warm-up periods in excess of ten minutes were not found to produce further changes in UV output. The average and standard deviation were calculated for each different lamp type.

Fluorescent lamps emitting less than 75 μwatts/lumen of UV do not require UV absorbing filters. Often the extra cost of filters prohibits their use, especially in smaller institutions where operating budgets are limited. The judicious choice of low UV emitting lamps would eliminate the need for filters resulting in substantial savings. Since purchase price can vary from one lamp to the other, it would be necessary to establish the actual cost of a lamp and whether higher costs would offset these savings.

VI. LUMEN OUTPUT

Lumen output is the total amount of visible light given off by a source. We have reported this value in the table to serve as a guide in judging the quantity of lamps necessary for a given lighting installation. Lumen output varies considerably from one lamp to another. We feel that for museum and art gallery applications, lumen output should not be the deciding factor in choosing a lamp. Colour temperature, UV emission and the colour rendering index take precedence over lumen output.

Lamp wattage is often used as an indication of the quantity of light given off by a lamp. This leads to a very disturbing misconception of the light output of fluorescent lamps. The wattage of a lamp is the amount of electrical energy it consumes. This electrical energy is converted into light energy by various means, such as incandescence of a tungsten filament, fluorescence of phosphors, etc. The efficiency of each mechanism varies considerably. The term "luminous efficacy" is used to describe the total quantity of visible light given off for each watt of electricity consumed. Fluorescent lamps have typical luminous efficacies of from 40 to 75 lumen/watt. On the other hand, incandescent bulbs vary from 6 to about 15 lumen/watt.

Consider the common 4-foot fluorescent tube (F40), rated at 40 watts. It can emit anywhere from 1700 to 3400 lumens of light. Consider now a household incandescent bulb of the same wattage. It gives off only 360 lumens. For comparison, a R40, 150-watt spot or floodlight emits 1825 lumens. We believe that museum staff are often misled by lamp wattages. The result is excessively strong lighting, especially in display cases lit by fluorescent lamps.

Because of the high energy costs of recent years, lamp manufacturers have strived to increase the lumen output of their lamps without increasing the wattage or significantly decreasing the colour rendering index. The recently introduced "prime colour" fluorescent lamp is a good example of this quest. The human eye responds most strongly to three specific narrow bands of colour in the visible light spectrum: blue-violet, pure green and orange red. Visual response to wavelengths other than these three bands is weaker. A fluorescent lamp which would emit light in only three discrete bands matching those of the visual system would have excellent lumen output, yet maintain reasonably good colour rendering properties; hence the "prime colour" illuminants.

The authors are aware of a least two companies producing these so-called prime colour fluorescent lamps (Philips' TL80 series and Westinghouse's Ultralume series). Colour rendering indices of 85 are reported and UV emissions are low (see Table 1). As well, manufacturers claim that prime colour lamps increase "seeability" and visual clarity. Because these lamps have become available only recently, there exists as yet no information on their suitability for museum and art gallery applications.

VII. CHOOSING THE PROPER FLUORESCENT LAMP

Table 1 incorporates necessary information on correlated colour temperature, ultraviolet radiation emission, the colour rendering index and lumen output for each lamp tested.

All the data was supplied to us by the manufacturers, except for UV emission, which was measured in our laboratories. The proper choice of fluorescent lamp will be done by referring specifically to this table. The following suggested sequence can be followed:

1. Specify a range of colour temperature that would best suit the type of exhibition and pick out all lamps that fall within this range.

2. From this list, eliminate those lamps that have a colour rendering index less than 85.

3. If possible, obtain the prices of the remaining lamps. Some companies will give discounts for bulk orders.

4. Lamps which emit less than 75 µwatts/lumen will not require filters, but some are more expensive. Determine whether it would be cheaper to use a low UV-emitting lamp, as opposed to a combination of high UV-emitting lamp and a UV filter. Remember, UV filters can be reused for years (at least ten).

TABLE 1

Fluorescent Lamp	Correlated Colour Temperature (°K)	Ultraviolet Emission* (μwatt/lumen)	Colour Rendering Index	Lumen Output
Philips				
F40				
Warm white 29	2950	70	53	3100
Warm white deluxe 32	2950	99	86	2100
Warm white special deluxe 27	2700	33	94	1700
cool white 33	4250	87	67	3200
cool white deluxe 34	3850	103	85	2100
cool white special deluxe 37	4200	33	96	1700
daylight 54	6700	103	82	2500
daylight deluxe 55	6400	107	95	2000
daylight special deluxe 57	7400	257	93	1700
colour-matching 47	5000	33	98	1830
TL 84	4000	73	85	3400
Westinghouse				
F40				
warm white	3000	87	53	3200
warm white deluxe	3000	160	71	2150
cool white	4100	101	67	3150
cool white deluxe	4200	144	89	2200
white	3500	90	58	3200
Living white	4300	103	90	2380
daylight	6500	106	73	2600
natural	3400	166	85	2080
merchandising white	3450	128	85	2410
supermarket white	4100	150	80	2330
colour match	purple	644	N/A	N/A
ultralume 3000	3000	59	85	2900
ultralume 4100	4100	47	85	2900
ultralume 5000	5000	51	85	2900

F15

warm white	3000	102	53	870
warm white deluxe	3000	160	71	610
cool white	4100	100	67	870
cool white deluxe	4200	135	89	610
daylight	6500	127	73	750
soft white natural	3400	155	85	590
white	3500	95	58	870
supermarket white	4100	155	80	650

VERILUX

F40

Full spectrum VLX/M	6200	47	high	1984
Full spectrum VLX	6200	152	high	2168

F15

Full spectrum VLX	6200	182	high	600

VERD-A-RAY

F40

cool white	4500	95	68	3150
daylight	6500	110	N.A.	2680
north white	5100	107	91	2740
north white fadex	5100	46	91	2740
CEZ	6750	90	N.A.	2730
CEZ/DP fadex	6750	28	N.A.	2730
verd-a-lite	3900	46	N.A.	2440
verd-a-lite fadex	3900	40	N.A.	2440
criticolour	5700	110	91	2120
criticolour fadex	5700	52	91	2120
emberglow	3100	78	N.A.	3250
indorsun	5700	152	91	2180
DSW 30	3000	56	N.A.	1860

F15

cool white	4500	105	N.A.	880
daylite	6500	118	N.A.	740
north white	5100	125	91	N.A.
north white fadex	5100	68	91	N.A.
CEZ	6750	95	N.A.	800
CEZ fadex	6750	56	N.A.	800
verd-a-lite	3900	57	N.A.	690
verd-a-lite fadex	3900	50	N.A.	690
criticolour	5700	125	91	600
criticolour fadex	5700	43	91	600
emberglo	3100	95	N.A.	890
indorsun	5700	150	91	710
DSW 30	3000	65	N.A.	475

DURO-TEST

F40

cool white	4500	100	68	3100
cool white double cathode	4500	95	68	3350
white	3500	83	64	3200
daylite	6500	112	75	2650
super white	5300	98	72	2860
super soft white	N.A.	190	58	2320
candelite	3000	83	56	3200
vita-lite	5500	223	91	2180
super deluxe 45	4300	150	73	2450
colour classer 75	7500	117	93	2100
optima 32	3200	123	82	2400
optima 50	5000	107	91	2200

F15

cool white	4500	96	68	870
daylite	6500	110	75	770
super soft white	N.A.	177	58	660
vita-lite	5500	157	91	640
optima 32	3200	105	82	675
optima 50	5000	100	91	640

Sylvania

F40

warm white	3050	85	55	3200
warm white deluxe	2950	103	73	2150
cool white	4300	90	67	3150
cool white deluxe	4100	123	86	2150
white	3500	88	62	3200
daylight	6500	110	79	2600
natural	3700	133	81	2050
design white	5000	112	82	2300
incandescent-fluorescent	2700	50	90	1600

F15

warm white	3050	99	55	890
cool white	4300	110	67	865
cool white deluxe	4100	150	86	585
white	3500	95	62	890
daylite	6500	123	79	740
natural white	3700	113	81	530
incandescent-fluorescent	2700	50	90	455

General Electric

F40

warm white	N.A.	75	N.A	3150
warm deluxe white	N.A.	85	N.A.	2150
cool white	4200	88	65	3150
cool white deluxe	4200	107	89	2200
daylight	7000	110	79	2600
white	N.A.	88	N.A.	3200
natural	N.A.	107	N.A.	2100
sign white	N.A.	103	N.A.	2440
chroma 50	5000	102	92	2200
chroma 75	7500	143	94	2000

F15				
warm white	N.A.	82	N.A.	870
warm white deluxe	N.A.	67	N.A.	600
cool white	4200	87	65	870
cool white deluxe	4200	95	89	610
daylight	7000	108	79	750
natural	N.A.	98	N.A.	590
Macbeth				
5000 F40	5000	237	high	N.A.

N/A	Not Applicable
N.A.	Not Available

- The average standard deviation in the ultraviolet radiation emission measurements was 9 μwatts/lumen (±5) and was mainly due to instrument differences rather than variations between lamps.

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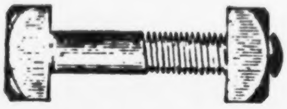
from HISTORY NEWS, February 1981. [illegible]



PRACTICALLY SPEAKING

A Lesson on Lighting

This article, written by the HISTORY NEWS staff, is based on a lesson included in AASLH's new independent study course, "Documents: Interpretation and Exhibition," prepared by William K. Jones, head of the Gerald R. Ford Presidential Library in Grand Rapids. For more information on this and other independent study courses offered by the Association, contact Patricia Hogan, Independent Study Coordinator, AASLH, 1400 Eighth Avenue South, Nashville, Tennessee 37203.

• • •

All light sources damage organic materials. The rate of deterioration is directly proportional to the amount of light on that material. Yet a gloomy interior at a historic site or museum where artifacts are displayed in dimly lit cases is not likely to attract many visitors. Thus a dilemma. On the one hand, there is the need for lighting sources that provide ample illumination and least distort natural color. On the other, as nondestructive an environment as is possible must be maintained.

Illumination from the sun, or natural light, is destructive to organic materials because of the high emission of ultraviolet radiation.

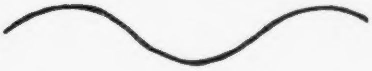
Both incandescent and fluorescent bulbs, the most common sources of artificial light, have advantages and disadvantages which should be considered. Fluorescent bulbs emit a soft flood of light that produces little shadow. Fluorescent light consumes less energy than incandescent and renders light more closely resembling natural light. The bulbs burn for more hours than incandescent bulbs. It is the ballast or transformer that produces heat in fluorescent lighting rather than the bulb itself. Fluorescent bulbs, however, produce more damaging ultraviolet radiation that should be filtered away from organic materials.

Incandescent light is less like natural light, produces a spotlight effect that causes shadows, consumes more energy, and produces greater infrared radiation. At the same time, however, incandescent bulbs emit far less ultraviolet radiation.

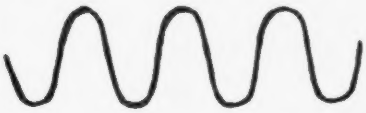
Basic light theory

To understand the effects of light and thereby choose the best possible light sources, it is necessary first to understand some basic principles of light theory. Light behaves in some respects like waves. In other respects, it behaves like particles. First consider the spectrum of colors formed—violet, blue, green, yellow, orange, and red—when light passes through a prism. Each color represents light of different wavelengths. The light in the spectrum is called visible light because it is light we can see. Beyond the violet light of the spectrum lies invisible light called ultraviolet light. Beyond the red of the spectrum is infrared light, also invisible. Think of both visible and invisible light as radiant energy.

In some ways radiant energy behaves like waves. Different kinds of light are characterized by their wavelengths. The wavelength of infrared light is long and of low frequency and might look like this:



The wavelengths of ultraviolet light, on the other hand, are shorter, more frequent, and, consequently, more energetic. An ultraviolet wavelength might look like this:

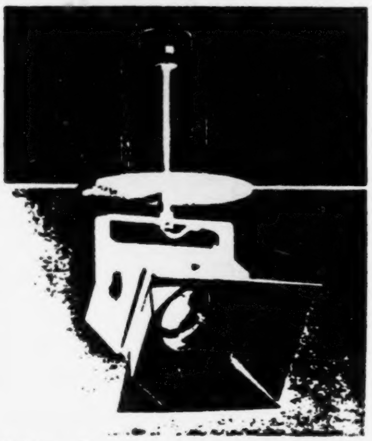


The wavelengths of visible light fall somewhere in between the short wavelength of ultraviolet light and the long wavelength of infrared light.

All sources of light or radiant energy have these three kinds of light—ultraviolet, visible, and infrared. Sunlight and fluorescent light, for example, emit great quantities of ultraviolet radiation. Incandescent light, on the other hand, has little ultraviolet radiation, but has a high proportion of infrared radiation.

The hazards

Radiant energy of different wavelengths affects organic materials in different ways. Ultraviolet radiation, however, is the most destructive to museum objects of organic substances. As the wavelengths of ultraviolet light are short and of high frequency, they are very energetic. When the radiant energy of ultraviolet light is absorbed by the molecules of an organic material, those molecules become "excited" and take on sufficient energy to undergo chemical



Lighting Services' renovator, shown here with a "barn door" fixture, converts recessed down lights to adjustable accent lights that can throw light in any direction.

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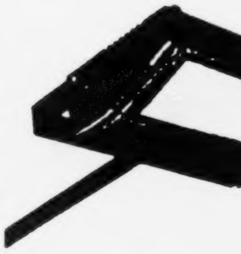

Lighting Services

A linear version of Lighting Services' Q400 series wide-angle floodlight, above, is used for broad wall washing. The fixture, coupled with an ultraviolet filter/shield, is recommended by the company for showroom, gallery, and art lighting, and architectural spaces. The quartz Lite Pak light, supplied by Rambusch, is available with four mounting devices: pedestal stand, picture light arm, track adapter, and canopy mount. The lamp cover contains a filter that blocks ultraviolet radiation.

reactions that result in the material's deterioration.

In preserving organic materials on exhibit, it is important to consider both the intensity of light that falls on the materials and the amount of time that the materials are exposed to the light sources. The same amount of damage will result from light of high intensity in a short period of time as from light of low intensity in a long period of time. For example, an object exposed to 100 foot-candles for 100 hours receives the same exposure as one exposed to 10 foot-candles for 1,000 hours. In both instances the object is exposed to 10,000 foot-candle hours. In other words, the damage is a function of the total exposure to light.

2 Convenient Ways to Protect Displays from UV Fading

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At first you may be discouraged by this concept. Damage seems inevitable, even if you control light intensity and exposure time. However, you may use this same concept to minimize damage. If you decrease the intensity of light by half, you decrease the damage by a half. Ten foot-candles of light for 1,000 hours (10,000 foot-candle hours) precipitates half the damage of 20 foot-candles for 100 hours (20,000 foot-candle hours). In the same way, you may decrease damage by shortening the exposure time, by turning lights off when the exhibit is not in use, or by rotating the objects in the exhibit.

Measuring light

There are, of course, limits. There must be enough light for visitors to see. Museum conservators suggest that a level of five foot-candles is acceptable for viewing and is the maximum amount of light to which the most sensitive objects should be exposed. Five foot-candles is approximately equivalent to the amount of light produced by a 50-watt light bulb at a distance of three to four feet. For information on measuring foot-candles using a camera's built-in light meter, see "Museum Lighting," HISTORY NEWS, April 1980.

Or, you can purchase a light sensor that measures light intensity. In addition, an ultraviolet monitor allows you to measure the proportion of ultraviolet radiation present in the light. Ultraviolet monitors measure the amount of ultraviolet radiation in microwatts. A reading of seventy-five microwatts or higher indicates that the ultraviolet radiation is sufficient to cause damage to the most light-sensitive objects.

Reducing light hazards

To reduce the damage from light, you must work with three variables: the level of ultraviolet radiation, the intensity of light, and the time of exposure.

First of all, objects should be protected from harmful ultraviolet radiation. This may be done by:

Removing organic materials from areas of direct sunlight or fluorescent light, or

- When objects cannot be moved from the source of ultraviolet radiation, filtering the harmful light.

Filtering the rays

One way to filter ultraviolet radiation is to filter the light source. Direct sunlight may be filtered by applying a plastic, pressure-sensitive sheet of ultraviolet-absorbing material to windows or skylights. A sheet of ultraviolet-absorbing plastic also may be suspended from the top of the window, much like a curtain. Plexiglas UF-3 and UF-4, available from plastic supply companies, also may be applied to windows to filter the ultraviolet radiation.

Fluorescent light may be filtered with specially made ultraviolet absorbing tubes which fit over the fluorescent bulbs. Once you have installed filtering materials over harmful light sources, you still should measure periodically the ultraviolet radiation of the filtered lighting. The filtering capabilities of some of these products may diminish with time. Remember if the measure of ultraviolet radiation is greater than seventy-five microwatts, sensitive materials will be damaged.

Other options

Obviously, the most effective way of reducing the amount of ultraviolet radiation in the exhibit area is to eliminate the kinds of light with high ultraviolet concentration. Shades or heavy curtains covering the windows will help eliminate sunlight. Fluorescent lighting systems can be replaced by incandescent light. Remember, however, that incandescent light emits heat which, if absorbed by the object, also may be harmful. Install incandescent lighting outside exhibit cases, and far enough from the organic materials to prevent heat build up.

Reducing the intensity of light also will help minimize damage to organic materials. Remember that conservators suggest five foot-candles is the maximum allowable light intensity for the most light-sensitive objects such as costumes, documents, prints and drawings, and natural history objects such as fur and feathers.

Another obvious way to decrease the intensity of light in the exhibit area is to use light bulbs of lower wattage. Measure the light intensity to be sure that the level of light is within acceptable limits.

Some supply sources

Once you understand basic light theory and are aware of and can measure the harmful effects of different light sources, you still must choose sources of illumination for exhibit areas. As lighting technology develops and improves, new products are introduced to the market place. Perhaps the best way to learn about and to compare these products—new and not so new—is to request product catalogues from the manufacturers and suppliers. A list of sources, certainly not exhaustive, follows.

■ Filter Light Corporation
P.O. Box 6292
Greensboro, North Carolina 27405
Fluorescent light filters

■ Manager, CNI Marketing
Department 4120
General Electric
Nela Park
Cleveland, Ohio 44112
Complete line of fluorescent, incandescent, quartz, high intensity discharge, and low voltage lighting products

■ GTE Lighting Products
Sylvania Lighting Center
Danvers, Massachusetts 01923
Fluorescent and incandescent light bulbs

■ International Light, Inc.
Dexter Industrial Green
Newburyport, Massachusetts 01950
Ultraviolet and/or visible light meters

■ Lighting Services, Inc.
150 East Fifty-eight Street
New York, New York 10022
Incandescent and quartz lighting fixtures, track lights, spot lights, light intensity reduction screens

■ Lightolier
346 Claremont Avenue
Jersey City, New Jersey 07305
Custom and decorative track, recessed, and high intensity light fixtures

■ Littlemore Scientific Engineering Company
Railway Lane
Littlemore, Oxford, England
Ultraviolet light monitors especially for museum use

■ Luxnor Lighting Products
350 Fifth Avenue
New York, New York 10001
Fluorescent light bulbs

■ McGraw Edison Company
HACO Lighting Division
400 Busse Road
Elk Grove Village, Illinois 60007
Custom and decorative track, recessed, high intensity, and low voltage lighting fixtures

■ Rambusch
40 West Thirteenth Street
New York, New York 10011
Quartz lighting fixtures

■ Solar Screen Company
53-11 105th Street
Corona, New York 11368
Fluorescent and incandescent light filters

■ Solar-X Corporation
25 Needham Street
Newton, Massachusetts 02161
Pressure sensitive and liquid adhesive film for windows

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Delaware Art Museum Seminar
October 29 & 30, 1979

Measuring Foot-Candles with a Photographer's Light Meter*

Set meter at ASA 100, f 5.6. Read light reflected from a white card. The notation of the shutter speed read from the meter (the denominator of the indicated fraction-of-a-second) equals the foot candles of the ambient light; that is, if the meter at the above setting reads 1/125, the foot candle measurement is 125.

NOTE: Be sure to hold the white card from which the reading is taken at the same angle at which the work of art in question is hung.

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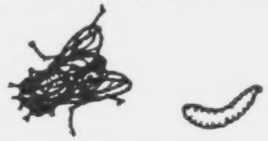
*p. 27a Fogg Museum Workshop Seminar, Conservation for Museum Professionals, Cambridge, Mass., November, 1979.

excerpt from NEWSLETTER of the Conservation Center for Art and Historic Artifacts, March 1980. pp.6-7.

Know Your Enemies

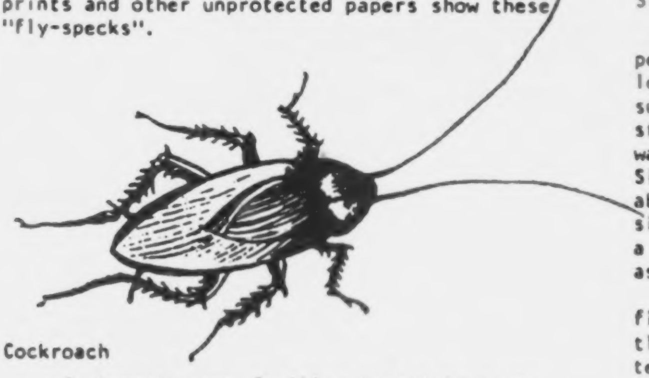
by VALERIE BASS

Every collection probably includes a certain number of insect "guests". Insects are always with us, though the kind of infestation will vary according to climate, location, environment, collection and building type. Curators and other personnel should be able to identify pests as they are encountered, and to recognize the damages. If undisturbed, a minor infestation can develop into a real problem, and cause considerable harm. Following is a brief description of insects that may be encountered in a collection, and the types of damage they may cause.



Fly

Flies breed quickly and live through the winter, hatching from eggs laid in moist organic matter. The adult fly poses the principal threat to artworks through its droppings. They excrete anywhere, and the small tarry masses dry quickly. Aside from being unsightly, these droppings are quite corrosive, and will stain and pit paper and other surfaces. Many unglazed prints and other unprotected papers show these "fly-specks".



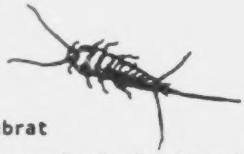
Cockroach

Cockroaches are familiar household pests, but not everyone is aware that they may also be a threat to collections. Their droppings cause damage similar to those of the fly, but magnified by the greater size of the insect. In addition, they will eat paper and books, causing damage that sometimes looks like the gnawing of mice. They hide in crevices during the day, and come out at night to feed on whatever is available. They are difficult to eradicate, as sprays and powders do not enetrate into their hiding-places, and their egg cases are impervious to insecticides. Cockroaches come in four varieties which differ in color and size. They all hatch from the egg into a wingless nymph, and progress to the adult stage through a series of molts. The nymph resembles the adults in its habits, general shape and color.

The Oriental cockroach is large, and appears black. It prefers a cool, moist environment, and is slower moving and less athletic than some of the other species. It can travel outdoors between buildings in the warmer months.

The German cockroach is brown, smaller than the Oriental, and more lively. It is fairly bold, and may sometimes be seen during the day.

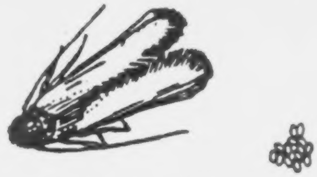
The brown banded cockroach is the most difficult to eradicate, due to its habits of gluing its egg cases to the undersides of furniture. Unlike other roaches, it is sometimes seen resting on the ceiling.



Silverfish and Firebrat

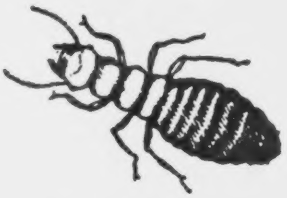
Silverfish are particularly damaging to paper. Silvery, segmented, soft-bodied and wingless, they avoid light, and prefer cool, damp surroundings. They eat carbohydrates (paste, starch), as well as glue, mold, sizings in paper, wallpaper and fabric, wool, silk and leather. Silverfish eat by rasping with their mouthparts, abrading the surfaces of paper as they eat the sizing, occasionally leaving the design areas as a relief. They do not eat the paper completely, as cockroaches do.

The firebrat is a relative of the silverfish, and resembles it, except that it is mottled rather than silvery, and prefers warmer temperatures.



Clothes Moth

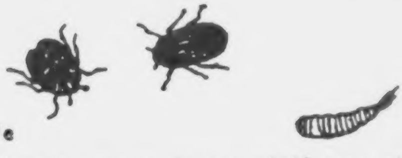
The clothes moth is a small, light tan or buff-colored moth with fringed wings. It lays its eggs on or near proteinaceous material, and the larvae emerge to eat wool, silk, hair, bristles and hides. This makes the moth a threat to costumes, upholstery, ethnographic collections, stuffed animals, and furs. Unlike the grain moth it may resemble, it hides from the light, and if disturbed it will seek shelter in crevices or the folds of fabric. The larvae encase themselves in protective tubes of silk and fabric fibers. They also produce "frass" - tan-colored bits of excrement held together with strings of silk. The eggs are laid loosely on the fabric and are easily brushed out.



Termites

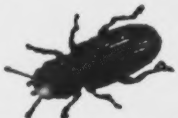
Termites will eat wool, paper products and a variety of cellulosic materials in rugs. They must stay in soil tubes which they will construct to preserve their body moisture, so dirt will be found around their holes. Subterranean termites must have contact with the main colony buried in the ground. They can be detected by the connecting tubes they build to the colony.

Dry wood termites are tropical, do not need contact with the earth, and are harder to detect. They can travel into a collection in a wooden object. An infested object will have small holes approximately 1/8" in diameter and will rattle when shaken because of the pelletized droppings inside. They eat wood in all directions, not just with the grain as subterranean termites do.



Carpet Beetle

Carpet beetles cause damage similar to that of the clothes moth. The larvae are attracted to the same proteinaceous materials, in addition to feathers, dead animals or insects, wasps or hives, and animal glues. They are not as easy to detect as clothes moths, as they are smaller, less visible, and considerably neater in their habit. They do not leave webbing or silk strands, but you may find shed larval skins. Both the clothes moth and the carpet beetle are very destructive. The carpet beetle in particular can be extremely difficult to eradicate.



Powder Post Beetle

Powder post beetles are the wood-eating insects most often found in art objects and furniture. The curator must be able to distinguish between active infestations, and old damage, possibly done before the tree was cut. Powder post beetles feed on seasoned wood, and in heavy infestations the wood is full of small round exit holes, and may have the appearance of being hit by a shotgun. If the damage is recent, the holes will be light colored, with no polish or finish clogging or darkening them. Little piles of wood dust may appear in or around the holes.

What To Do

It is the curator's responsibility to be on the alert for insect problems. Good protective measures include checking new acquisitions, boxes and crates, and periodically examining the interiors of picture frames, and textiles and furniture in the collection. If any of these insects are seen in a collection, or if signs of active infestation are found, a qualified professional should be brought in. If possible, this individual should be someone familiar with the special care requirements of objects in a museum. If such a person is not available, the curator and a conservator should work closely with the exterminator.

Much of the information in this article was taken from a lecture by Dr. Thomas Parker given at the Winterthur Museum. He is an entomologist familiar with museum pest problems and is available as a consultant. He can also recommend qualified exterminators.

For further information, contact: Pest Control Services Inc., 44 W. Essex Avenue, Lansdowne, PA 19050, (215) 284-6249.

Valerie Baas

FOR ART AND HISTORIC ARTIFACTS PHILADELPHIA, PA 19103 (215) 545-0613

PEST CONTROL

Principles of pest control in collections; a summary of information provided by Tom Parker, Pest Control Services, Inc.

1. **Prevention:** Prevention is more successful than control. Continual inspection routines are necessary. White surface storage shelving and solid color exhibit case floors facilitate oberservation of frass. All new accessions from questionable sources should be quarantined and inspected before being stored with the rest of the collection.

2. **Identification:** Proper identification of pests and an assessment of the inactive or active status of damage is necessary.

3. **Tight building:** The building should be tightly sealed without door or window sill openings or foundation perforations. Buildings without exterior infestations (rats, pigeons) are more secure from interior problems. Gardens with flower plantings are attractive to beetles. Interior cut flower displays can cause infestations.

4. **Habitat control:** RH conditions can favor or stress pest ecology. Higher RH, beginning at 50%, favors mold, feeding pscocidae and silver fish, small insect dependant dermestidae and larger insects such as roaches and roach feeding mice. Keep micro-climates and corners ventilated.

5. **Storage formats:** Some storage formats and protective container designs can inhibit infestation.

6. **Unsuitable control techniques:** Some pesticidal application techniques are unacceptable for use in proximity to collecitons. Wettable powders and oil concentrates leave damaging residues. Aerosols and emulsified concentrate sprays have a short life and are ineffective against hidden bugs. Generally, "space" treatments, especially "fogging" are ineffective and can harm collections. Baits are unacceptable for use on rodents as hidden bodies can cause bettle infestations. Repellants such as naphthalene flakes are useless.

7. **Effective controls:** Effective treatments for protection of collections are:

    a) Vacuuming
    b) Physical sealing and screening of holes and drains, pipe risers and stacks with steel wool packing and silica gel barriers.
    c) Traps and stick boards for rodents.
    d) "Chemagro" 2% Baygon bait in 1/8 teaspoon doses in quiet corners for large roaches.
    e) Silica gel with Pyrethrum, "Dri-Die," "Drione", applications along insect pathways for carpenter ants and silverfish.

BUILDING SECURITY:

Useful Publications: An Approach to Museum Security, by Denis B. Alsford, C.M.A. A thorough and practical guide to external and internal building security, with illustrations.

101 Ideas from History News, AASLH. The chapter on "Security and Protection" describes various products, do-it-yourself devices, and information sources for increasing the security of your building.

Protecting Our Heritage, NFPA with assistance from AASLH. Subtitled "A Discourse on Fire Protection and Prevention in Historic Buildings and Landmarks", the book tackles the unique problems of fire protection and concealment of equipment in old or restored buildings.

Fire and Theft Security Systems, by Byron Wells (TAB Books). An illustrated primer explaining the options in security alarms, often citing brand names. 101 Ideas (AASLH) describes it as "an invaluable book...if you're planning to deal with a commercial alarm company or contemplating building your own system".

Advisory Services:

- Police Department	Will give detailed and practical advice on making your building more theft-proof.
- Hydro Inspector	Inviting an inspector during the planning stages of a renovation can save a lot of grief. Hydro inspectors will not approve electrical goods without a CSA or ULC guarantee.
- Insurance Advisory Organization of Canada	Tests products and makes recommendations to insurance companies. Their experts will give advice to insurers. Ask your insurance company to contact them; it can make a difference to your insurance premium.
- National Fire Protection Association (NFPA)	An information service on which almost all building codes are based. It publishes excellent advisory booklets on fire safety, among them Archives and Records Centers, Protection of Museum Collections, and Protection of Records.
- Underwriters' Laboratories of Canada (ULC)	A non-profit organization which tests and issues certificates for approved burglary and fire protection equipment. All alarms and security hardware should be ULC-approved. ULC publishes a 2-volume List of Equipment and Materials, giving recommended products and suppliers.

Watch for UL (Underwriters' Laboratories) or CSA (Canadian Standards Association) labels on the electrical goods you buy. All goods sold in Ontario should have this, but those purchased across the border may not. When letting contracts, specify that all materials be UL or CSA approved.

Suppliers of Security Equipment:

Without wishing to discriminate against other reputable suppliers, we have limited this listing to two firms. Both are large companies with highly trained staff and experience in working with institutions. Note that ADT locks are considered better than most, in that they are more difficult to pick. Reilly Locks, Toronto is the Canadian distributor for these.

ADT Security Systems, Toronto (Willowdale) and branches; Chubb Industries (Chubb Mosler), Brampton and branches.

Fire Protection:

- Automatic Systems	The advisory services and security companies listed above will give guidance on automatic fire detection and extinguishing systems.
- Fire Extinguisher (A-B-C Class or Tri-Class)	The A-B-C Class multi-purpose dry-chemical extinguisher is the only type which will handle ordinary combustibles, flammable liquids and electrical fires. Sizes range from 5 lb. to 30 lb. The fire department will advise on the size, number and placement of extinguishers for your institution. $32.00 (5 lb.) to $117.00 (30 lb.) *Safety supply and fire protection companies.*
- Older Fire Extinguishers	Carbon tet extinguishers are no longer on the market; an extremely toxic gas is released when the chemical contacts hot ferrous metal. If you have one of these, get rid of it. Soda-acid extinguishers frequently corrode and can break when tipped; have them tested regularly. (Note that this type is good for ordinary combustibles only, not for flammable liquids or electrical fires.)

Inspect your fire extinguishers regularly, to ensure that the hose and seal are in good order. Every 5 or 6 years (or as specified on the label), the extinguisher should be hydrostatically tested, a process in which the contents are taken out and the container pressure-tested. Any fire extinguisher company will do this.

- Smoke Detectors	These are the most sensitive detectors and will give an earlier warning than heat or flame detectors. In open areas, one detector will monitor 900 sq. ft. of space. There are battery-operated types, or electrically-wired types which can be interconnected so that the alarm sounds throughout the building. They are fairly easy to wire into an existing alarm system. $25.00-$30.00 (installation of electrically wired detectors extra) *Safety supply and fire protection companies.*
- Paints	Old paints which contain lead or linseed oil are very flammable, and some latex and acrylic paints will also burn. The NFPA is a good source of information on paints which self-extinguish under heat. The ULC can also advise you on fire-retardant coatings.

excerpt from MUSEUM AND ARCHIVAL SUPPLIES HANDBOOK, Toronto,
Ontario Museum Association & Toronto Area
Archivists Group, 1979. 2d ed. p.74-79. (3d ed. due 1983)

- Storage of Flammable Materials	Oily waste cans, safety cans, safety storage cabinets, etc., are listed in Section III: General Equipment - "Containers".

FUNGICIDES & PESTICIDES:

Fungicides: These are some common fungicides referred to in the standard texts.

- Ethyl Alcohol	A sterilizer for mouldy artifacts which will not be affected by water or alcohol. The object must be thoroughly cleaned with vacuum and/or brush, before washing in ethyl alcohol and water (70/30) solution. *See Section I: Chemicals & Solvents.*
- Formalin (Formaldehyde Solution)	Used as a preservative in starch pastes. $4.40/litre *Scientific suppliers.*
- Hyamine 1622	For surface treatment of mould on photographs and other materials. $59.00/10 lb. keg 100% solids *Rohm & Haas, Toronto and distributors.*
- Lysol	Used as a fungicidal spray; will not stain paper. For spraying a lot of material, use with a small pump-type spray gun. Lysol spray should not be confused with the soapy mixture which is also available. *See Section I: Chemicals & Solvents.*
- Thymol	Used as a fungicide and as a preservative in starch pastes. Do not use on photographs or oil paintings, or near thermo-setting plastics like plexiglas, which will deteriorate. Caution: Thymol is a cardiac depressant, so mould treatment should be carried out in a fumigating box. $16.90/¼ lb. crystals *Scientific suppliers.*
- Thymol-Impregnated Sheets	For emergency situations such as flooding, thymol interleaf sheets can be prepared using bond paper or unprinted newsprint. The paper is immersed in a 10% to 15% solution of thymol in ethanol, acetone, denatured alcohol or trichloroethane, and hung to dry before interleaving. The mixture is toxic and flammable. Prepare sheets out of doors, using rubber gloves, goggles and a respirator of the type used by painters.

Pesticides: Getting the Bugs Out (Phil Ward, B.C. Provincial Museum) is a practical, illustrated guide to recognition of insects harmful to museum collections, and the methods and materials used to control them.

- Ant Traps, Green Cross Powder, etc.	For control of itinerant insects in the storeroom. *Hardware stores.*

- Fogging	This method, and the materials required for it, are described in Getting the Bugs Out (Ward) p. 11. $95.00 West "Spacemaster" Jet Fogger $15.95/gal. drum "Vaposector" $17.95/gal. drum "West Fog" *West Chemicals, Toronto and branches. For protective clothing, consult the Safety Supply Company catalogue.*
- Fumigating Box	See listings in Section III: Safety Supplies, and diagram in Ward (p. 13).
- Fumigators	Advice on what to ask for and expect from a fumigator is given in Getting the Bugs Out (Ward) p. 10. Check with conservators at CCI, Queen's or ROM on the suitability of any fumigant to be used on collections.
- Moth Crystals, Moth Flakes and Mothballs	Either paradichlorobenzene (PDB) or naphthalene, sold in these forms, give effective protection against clothes moth and dermestid beetle. May be placed in storage bags and boxes, or scattered in drawers between layers of paper. Both types are good only as long as the gas is volatizing, and should be replaced as soon as they are exhausted. Caution: PDB is a liver poison, so avoid prolonged exposure to its vapours. *Supermarkets, druggists, department stores.*

HUMIDITY, TESTING AND CONTROL:

A relative humidity of 35% to 55% is considered best for human comfort; this is roughly true also for the health of historical materials. However, any increase in RH which can be achieved and maintained in collection areas will reduce the number of eventual conservation problems.
Relative Humidity: Its Importance, Measurement and Control in Museums (CCI Technical Bulletin #1) describes RH and the part it plays in the deterioration of museum and archival materials. Acceptable RH levels, and some equipment for monitoring and controlling it, are discussed. See also Recommended Environmental Monitors (CCI #3) for extensive listings of equipment and advice on their use.

Measurement of Relative Humidity:

- Hair Hygrometer	Not as accurate as the instruments listed below, but will give a general indication of RH levels. Direct reading. $6.59 *Department stores.*
- Sling Psychrometer	A simple and more accurate instrument, consisting of a wet-bulb and a dry-bulb thermometer in a rotating rod. The instrument is swung rapidly for 1½ to 2 minutes, giving temperature readings which are converted to RH by means of the chart provided. $30.00 *Scientific suppliers.*

- **Bendix "Psychron" Psychrometer**	Works on the same principle as the sling psychrometer, with a small battery-powered motor replacing the need for manual rotation. Readings in 2 minutes. $98.00 *Fisher Scientific.*
- **Beckman "Humi-Chek" Hygrometer**	A battery-operated hand-held instrument which gives direct readings of RH. Unlike psychrometers, it does not give a room temperature reading. Readings in 1-2 minutes. $284.65 (duty-free price) Regular Humi-chek #2, soft case. $342.15 (duty-free) Deluxe Humi-chek #2, hard case and calibration kit. *Beckman Instruments Inc., Toronto.*
- **Recording Thermohygrograph**	Records RH and temperature on a graph. The instrument is calibrated using a psychrometer or hygrometer. $650.00 and up *Central Scientific, Mississauga and branches. Similar instruments are the Haenni Hair Thermohygrograph from Sigma Instruments, Etobicoke; the Lambrecht Thermohygrograph from James Stevenson, Scarborough; and others available from scientific suppliers.*

Humidity Control: When tackling the low humidity levels of winter, remember that your building should be well insulated and protected by a vapour barrier, to avoid damaging moisture condensation within the outer walls and ceiling. Windows must be double-glazed. Without insulation and double glazing, the humidity level cannot be raised very high before condensation results, especially at sub-zero temperatures.

- Central Systems	The furnace can be equipped with a humidification unit, connected directly to the water line. A dehumidification unit can be integrated with the air-cooling unit of the furnace system; this will greatly reduce the high levels of natural humidity in summer. The Armstrong Humidification Book gives information on various steam humidifying systems which are largely maintenance-free; the company's Canadian representatives will advise on these systems. Relative Humidity (CCI #1), p. 13, discusses the general factors involved in the installation of central air-conditioning systems.
- Dehumidifier	A large dehumidifier can draw 14.2 litres per day from an area of 34,500 cu. ft. Size of this machine is 22" x 12" x 15". $170.00 (net) *Paul Wolf, Toronto (net price to institutions); or other electrical distributors.*

- Humidifier	Choose the type with a foam wheel rather than a cloth wick, for greater capacity. One example (the largest Hotpoint model) has a reservoir capacity of 31.8 litres, and a daily output of 118.2 litres when the surrounding air measures 10% RH or 86.4 litres at 20% RH. $114.00 (net) Hotpoint humidifier *Paul Wolf, Toronto (net price to institutions); or other electrical distributors.*
- Silica Gel	Can be used to humidify or dehumidify in an enclosed space, such as a display case or closed storage unit. The self-indicating type of silica gel is blue when dry, pink when saturated. The crystals can be dried at 110 C for re-use. Crystals may be placed in open pans or gauze bags, but should not come in direct contact with objects. $6.50/500 grams (coarse or fine mesh) *Scientific suppliers.*

Turn the thermostat down a few degrees in winter. The cooler the room, the smaller the amount of air vapour required to raise the humidity!

LIGHT, TESTING AND CONTROL:

Museum Lighting (CCI Technical Bulletin #2) explains the problems associated with museum lighting, and gives techniques for minimizing deterioration by reducing the levels of light intensity and ultraviolet radiation.

Measurement of Light Intensity:

Recommended Lighting Levels for Display Areas:

Maximum 50 lux (5 foot-candles)	Extremely sensitive materials Textiles, especially silk Watercolours, prints, documents, illuminated manuscripts, etc. Dyed leather Feathers Vegetable-dyed ethnographic material Lacquer
Maximum 150 lux (15 foot-candles)	Sensitive materials Oil and tempera paintings Undyed leather Horn
Maximum 300 lux (30 foot-candles)	Insensitive materials Metal Stone Ceramics and glass Wood

- ROM Museology Course handouts.

- Foot-Candle Meters	Gossen Panlux Foot-candle Luxmeter. $200.00-$225.00 *J.E. McCutcheon Ltd., Toronto and branches; Photoquip Ltd., Toronto; some photographic stores.* *ROM/CCI* Spectra Candela LD-300 Foot-candle Meter $234.00 *Alex L. Clark Ltd., Toronto and branches.* Gamma Scientific Digital Photometer Model 820, with Detector Head model 820-30L calibrated to measure lux. $2,130.00 *Technical Marketing Associates Ltd., Mississauga and branches.*
- Light Meters	Seconic Studio Deluxe Light Meter L-398. Seconic and similar meters are often used in photographic studios and by news photographers, and it may be possible for you to arrange a general lighting test of your display areas through one of these professionals. Although not as sensitive as the foot-candle meters listed above, this light meter will give approximate readings down to 5 foot-candles. $79.95 *Photographic stores.*

Since the effect of light is cumulative, particularly sensitive objects should not be on continuous display but should be retired to storage after a period of exhibition.

- CCI Technical Bulletin #2

Test For The Effects of Light:

Fading of light-sensitive materials exposed to a constant light level in storage or display areas can be a serious factor in deterioration. Make test, using the standard fading cards (blue series) to prove your point, if necessary.

- ROM Museology Course handouts.

- Blue Scales (Textile Fading Cards)	Fading cards are pieces of wool cloth dyed with blue dyes of different degrees of fastness. Used to monitor the net exposure to light given to objects on display, and to alert conservators to rotate an exhibit or to reduce the intensity of illumination $1.10/each, discounts on larger amounts. *TALAS, New York.*
- Grey Scale For Assessing Change in Colour	The standard contrast chart against which are measured the textiles being tested and the exposed blue scale. Issued by the British Standards Institution, Lohdon. BS 2662:1961. $22.20 *TALAS, New York.*

Ultraviolet Light:

Beyond the need to control the levels of visible light reaching museum objects, it is mandatory to eliminate as much as possible of the non-visible, ultraviolet radiation. It should always be remembered that the percentage of ultraviolet radiation in natural sunlight is greater than in fluorescent lighting. Incandescent lighting has virtually none. If the exhibition area is unfortunate enough to receive daylight, sensitive objects should not be placed in direct sunlight or strongly lit areas.

- "Museum Lighting" (CCI #2)

Measurement of UV Light:

- Elsec UV Light Monitor Type 760	The least expensive of these specialized instruments. Pocket-sized, operated by an internal battery, gives a direct reading. $322.00 U.S. *Littlemore Scientific, U.K.; Science Associates Inc., Princeton, N.J.*

Control of UV Light: With or without a UV reading, you can assume that collections receive too much UV radiation if they are lit by unshielded fluorescent lights or by sunlight.

- Filter Sleeves for Fluorescent Lights	Plastic sleeves which are slipped over the light tube before insertion into the fixture. All are effective UV filters; they vary mainly in the duration of their effectiveness, according to manufacturers' claims. ARM-A-LITE FILTER RAY CLEAR: Filter tubes with black light-proof end caps. Said to filter effectively for 25 years. Lengths of 18", 24", 36", 48", and 96". $9.15/48" sleeve *Lightmaster Corp. Ltd., Burlington (M.O. $40); Certified Electric Co., Dundas (M.O. $30).* RAYSFIELD 403 SLEEVES: Claimed to filter effectively for 10 years. Light-proof end caps. Twelve lengths from 15" to 96"; price according to length. $5.65/42" sleeve (48" not available) *Commercial Plastics, Toronto, Ottawa, Montreal. (M.O. case of 24 sleeves; 10% museum discount).* SOLAR SCREEN FILTER TUBES: No information on effective life. 48" lengths; tubes may be cut to fit shorter lights. $28.00 U.S./24 tubes; $85.00 U.S./100 tubes $1.86/each from THB (for smaller orders) *Solar Screen, Corona, New York; Toronto Historical Board, Toronto.*
- Plexiglas, UV-Filtering	A permanent UV filter, used for framing and display cases. The electro-static charge on plexiglas makes it unsuitable for framing pastels, charcoals, or any picture with an unstable surface). *For details on "UF-1", UF-3" and UF-4" plexiglas, see Section I: Synthetic Sheeting.*

- **Scotchtint UV Window Filters**	A clear film for use on windows, case fronts. Can be self-installed; the manufacturer's guarantee applies only if professionally installed. Check first with supplier if you intend to install film on thermopane windows. Type A. 18 is made for normal conditions; Type P. 18 is better for high condensation conditions. Claimed to filter effectively for 25 years. $1.50/sq. ft.; $2.50/sq. ft. installed *Convenience Products, Toronto; Preston & Lieff Glass, Ottawa; local glaziers or 3M distributors.*
- **Verilux VLX/M Fluorscent Lamp**	A self-filtering fluorescent tube which can be used without filter sleeves. Extremely low in UV emission; meets the lighting standards of the Metropolitan Museum in New York. Presently available only in 48" lengths; can replace 40-watt lamps in standard 110 volt 50/60 Hertz fixtures. Rated life of 26,000 + hours. $7.00 U.S. each *Verilux Inc., Greenwich, Conn.*
- **Verd-a-Ray Fluorescent Lamp**	Self-filtering fluorescent tube, extremely low in UV emission. Guaranteed for 30,000 hours or 30 months. Available in 18", 24", 36", 48" and 96" lengths. Sample prices: $14.74/48" tube (partial case) $13.40/48" tube (full case of 24 tubes) *Verd-a-Ray Industries Ltd., Montreal.*
- **Wall Paint**	Museum Lighting (CCI #2) suggests that much of the UV radiation from sunlight passing through windows can be removed by reflecting the light from walls painted with titanium dioxide or zinc white pigments. These white pigments are good absorbers of UV light. The indirect lighting that results from reflection will contain little ultraviolet. Pure titanium pigment is used in the better quality, more expensive paints on the market.

Manufacturers' claims are not infallible, and it is wise to have UV-filtering products checked periodically. If you do not have the equipment for this, you may be able to arrange for a test through a college or university in your region.

POLLUTION CONTROL:

- **Dust Curtain**	Cloth or polyethylene sheet (see Section I: Synthetic Sheet) can be used as a dust curtain on storage shelves. The curtain should have fasteners at the top so that both hands are free for handling objects. If the curtain has a dowel along the bottom, it can be rolled up into hook rests; otherwise, ties are necessary.

- Vent Filter	For particles that escape the furnace or air-intake filter, Tack Cloth placed over room vents will provide an effective screen. *See full listing for Tack Cloth in Section I: Fabrics - "Dusting & Polishing Cloths".*
- Sulphur Control	CAMPHOR absorbs sulphurous gases. Place it in closed storage containers and display cases where sulphur may affect objects, particularly archival material, textiles and leather. Do not let the camphor touch the object. *Drug stores.* SILK treated with a 15% lead acetate solution will absorb sulphur, and may be used as a backing material for cases. (See Plenderleith, p. 241, for a short description of its preparation.) *Lead acetate from scientific suppliers.* ANTI-TARNISH TISSUE: A paper impregnated with sulphur-absorbing chemicals, developed to prevent gases from attacking silver. These papers should not be in direct contact with the metal. For storage, wrap the silver in acid-free tissue paper, then in anti-tarnish paper. For display, place paper inconspicuously in exhibit cases. $5.50 +FST/roll 7-3/4" wide; length unknown $12.00 + FST/roll 20" wide; length unknown $12.60 + FST/ream of 20" x 30" sheets. *Burco Tools, Toronto; H&W Perrin, Toronto.* PACIFIC SILVER CLOTH: A brown cloth used by jewellery stores for lining drawers. Can be used to wrap silver. The material is always in short supply, so expect a delay in obtaining it. $12.00/yard *Birks stores; Eureka Manufacturing Co., Mass.*
- Electronic Air Cleaners	FURNACE UNITS: Forced air furnaces are normally equipped with filters that trap 45%-50% of the dust. In heavily polluted areas, furnaces can be fitted with an electronic cleaner which filters 90%-95% of dust; can be provided with a continuous fan for year-round use. Large buildings will require the industrial size of cleaner, which is considerably higher in price than the domestic model quoted here. $450.00 - approximately, installed (domestic size) *Furnace and heating companies.* CEILING AND WALL UNITS: Single-room units designed to serve public areas. The cost of the unit can be offset in the long run by an appreciable saving in heating/air conditioning fuel costs, since the unit takes over much of the air-flow requirements set by law for public areas. The price quoted here is for a 30' x 30' x 10' (restaurant) area in heavy use.

- Electronic Air Cleaners (cont'd.)	**$1000.00 - approximately** ***Wait-Skuttle Co., Oakville (the firm's engineering office will advise on the most efficient unit for your requirements).***

New concrete buildings produce a lot of ammonia in the first year. This can tarnish metals, and weaken and embrittle silk and other materials.

Fumes from ammine-based paints will cause problems with painted objects. If you use these paints in storage or display areas, allow the the areas to dry and air for as long as possible before installing collections.

TEMPERATURE, TESTING AND CONTROL:

Temperature Measurement:

- Thermometers	Recommended Environmental Monitors (CCI #3) suggests the use of mercury or bimetallic strip thermometers for measuring room temperature. $3.50 *Department stores, hardwares.*
- Surface Temperature Probe	Larger institutions use these instruments to test the surface of objects; for example, when strong spotlights may be raising the object's surface temperature far above room temperature. $ 84.45 - #15-176-32 *Fisher Scientific; other models available from scientific suppliers.*
- Psychrometers and Thermo-hygrographs	Both give an accurate temperature as well as a humidity reading. *See listings under "Measurement of Relative Humidity", above.*
- Thermopapers	Heat-sensitive paper strips record temperature by an irreversible change in colour within one second of exposure. Papers record in 5% increments from 100% F to 120% F, and in 10% increments from 120% to 500%. For use during shipment, unmonitored storage, in drying chambers and on hot tables. $4.75/package of 60 strips *TALAS, New York.*

Temperature Control: On the questions of insulation and air-conditioning, it is best to have company specialists do an individual assessment of your building. Here, we can offer two products, one suggestion and a booklet.

Keeping the Heat In; a primer on heat preservation and insulation, put out by the Department of Energy, Mines and Resources, Ottawa.

- Incandescent Heat Shield	The heat generated by incandescent lights, either as track lighting or spotlights, is considerably reduced by these filters. Prices vary with the type and size of lamp; inquire directly for costs on the lamp you are using. *Lightolier Ltd., Markham; Paul Wolf, Toronto (discounts to institutions); or the lighting company which supplied the original fixtures.*
- Fluorescent Lights	Fluorescent tubes themselves stay cool, but the ballasts can produce unwanted heat if they are inside a closed case. Alter cases so that ballasts are on the outside.
- Mirror Film (Aluminized mylar sheet)	Your building may be suitable for this treatment. Mirror film on windows cuts down the interior heat by reflecting the sun's rays. (It can also cut down on pollution, since there is less need to open windows.) Do not use on the inside of double-pane thermal windows, tinted glass or plexiglas. The film can be self-applied. $1.25/sq. ft., up to 60" width *Suburban Glass, West Hill; or other glass and mirror companies.*

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Recommended Environmental Monitors for Museums, Archives and Art Galleries

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Abstract

Instruments for monitoring museum environmental conditions, including relative humidity, temperature, lighting, and air pollution, are described in detail. Recognizing that not all institutions can maintain high quality continuous records of their environmental conditions due to limited budgets, potential users are divided into three practical categories. A "kit" of recommended instrumentation is described for each category and should be simultaneously available at an institution. Sample forms for reporting environmental conditions are also shown.

1.

Introduction

It is well known that variations in relative humidity, high temperatures, intense lighting and air pollution have serious effects on museum objects. The dimensions of a canvas will change when subjected to variations in relative humidity (RH), inevitably resulting in the cleavage of the pigment layers of the painting. Intense lighting can cause fading of pigments, especially in watercolours, archival materials, pastels and textiles. The corrosion of metal objects - bronze disease - varnish bloom, etc., - is frequently a direct consequence of, or is severely aggravated by, pollutants present in the air. The importance of environmental control in an art gallery, museum or archive, therefore, cannot be overemphasized.

Unfortunately, it is often not possible for a small institution to acquire a large and expensive system of instrumentation which would offer an excellent control of the environment in the building. Certain small steps can be taken without spending large sums of money, however. For example, the temperature can be kept at lower values between 20° and 21°C (68°-70°F) in the winter months which will help avoid dessication due to low RH. Inexpensive portable humidifiers can be used to maintain sufficient RH. Works of art can be kept away from direct sunlight coming through windows. Inexpensive filters can be used on fluorescent tubes to absorb their ultraviolet (UV) output. Lighting throughout the institution can be kept at relatively low and safe levels, and floodlights can be properly placed in order to minimize heating effects on the object displayed. This is only a small list of precautions that can be taken.

To assess the effectiveness of these and other environmental controls, it is necessary to monitor the environmental conditions inside the institution. The four areas of concern are temperature, humidity, lighting and air pollution. It is recognized that not all institutions can maintain the highest quality continuous records because of the high cost of the necessary equipment. Therefore, the potential users of monitoring equipment are divided into three practical categories:

Type A) An institution which needs simple and reliable but inexpensive equipment to monitor conditions only occasionally.

Type B) An institution undertaking to maintain continuous records of various conditions, particularly of RH, temperature, and perhaps lighting.

Type C) An institution which undertakes to maintain complete, accurate, and continuous records of all environmental conditions.

As shall be seen subsequently, the measurement of relative humidity or temperature or lighting level is usually a quite straightforward procedure. Surface rise in the temperature of objects due to strong spotlights can be measured, but the more sensitive and accurate instruments required are rather expensive. The determination of pollutants in the air at normal ambient levels also requires expensive instrumentation.

2.

Relative Humidity Monitors

In this and subsequent descriptions of monitors, the usual format will be to start with the least expensive and work our way up to the most expensive. A summary of recommended instruments for Type A, B and C institutions is found in Appendix 1 (page 15) which follows the detailed descriptions.

To avoid confusion, it is best to first define the types of instruments. Any instrument that measures relative humidity may be called a hygrometer. A psychrometer, on the other hand, is an instrument that measures only wet bulb and dry bulb temperatures.

An instrument that is extensively used because of its low cost and simplicity is the sling psychrometer (Figure 1). It is comprised of two thermometers (held in a common base or body), one of which has its bulb covered with a cotton wick which is wetted before being used. The "wet bulb" thermometer will indicate a lower temperature than the "dry bulb" thermometer due to the cooling effect caused by evaporation of the water. The rate of evaporation is directly related to the amount of water (moisture) in the air. One reads the dry bulb temperature (the actual temperature in the room) and the wet bulb temperature, and then the relative humidity is obtained from psychrometric tables (usually available with the instrument) using these two temperature values.

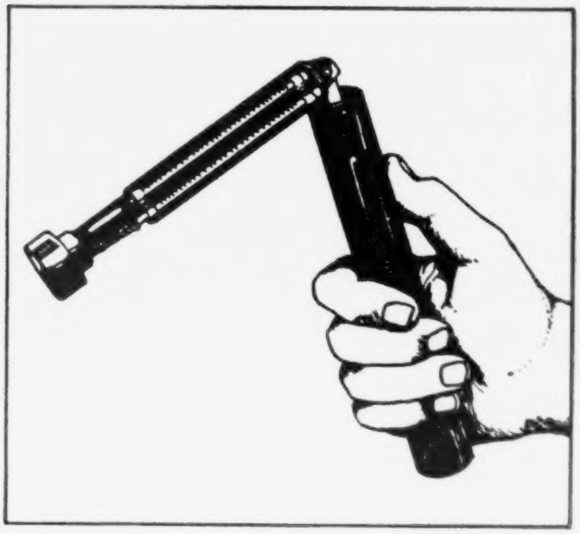

FIGURE 1. Typical sling psychrometer. Notice the cotton wick covering one thermometer.

In order for this method to produce accurate results, there must be adequate air flow around the two thermometer bulbs. With the sling psychrometer, one rotates the thermometers (mounted to an attached handle) for about 1 1/2 minutes at a constant speed of 2 or 3 revolutions per second.

Several types of sling psychrometers are available and can be purchased at any Fisher Scientific[1] or Canadian Laboratory Supplies[2] outlet in Canada for about $20 to $25.* Because the sling psychrometer generally gives inaccurate results for RH below 25% or 30%, it is not recommended for museum use. To minimize these errors, an improved psychrometer is available which includes a built-in fan and motor. This instrument (e.g. the Bendix[3] "Psychron" psychrometer) works on the same principle as the sling psychrometer, except that a small electric motor and fan produces the required air flow across the two bulbs (Figure 2). The motor is powered by three size-D, 1.5 volt batteries. A small light behind the thermometers makes it easy to use when working in dark areas. The usual procedure is to start the Bendix psychrometer and wait at least two minutes before actually taking a reading. This will assure sufficient time for the wet bulb to reach its proper temperature. This instrument is reliable, accurate, trouble-free and easy to use, and for these reasons it is certainly the better instrument for all institutions, large or small. The Bendix psychrometer sells for about $110 at any Fisher Scientific outlet.

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* "All prices listed in this bulletin are approximate quotations."

The advantage of any psychrometer is that it gives the ambient temperature (dry bulb temperature) of the room. In this way, both temperature and relative humidity can be monitored with the same instrument. In general, there are no problems encountered with the use of psychrometers, except that one must make sure the wet bulb does not dry up or become too covered with salts while in use. Replacement cotton wicks usually come with the instruments. Regular changing of the wick assures good results.

It is possible to monitor relative humidity by using electronic devices which read directly in % RH. These hygrometers utilize different types of sensors, most of them showing electrical properties which vary depending on the relative humidity surrounding the sensor.

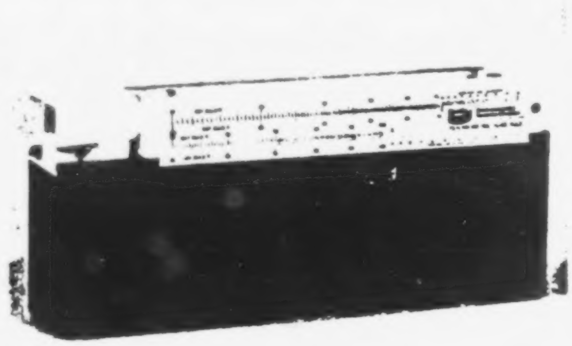

FIGURE 2. The Bendix "Psychron" psychrometer. A small motor and fan arrangement provides air circulation.

One such instrument on the market is the Beckman* "Humi-chek" (Figure 3). It is very easy to operate, and reads directly in % RH at the press of a button. There is no bulb to wet. A 9 volt transistor radio battery, which should be changed about every six months, produces power for the electronic components. An accuracy of ±2% in the measured RH is claimed over a range of 15% to 95% RH. These accuracies are under controlled conditions inside constant humidity chambers. A more realistic figure would be ± 3%-4% for various conditions of RH and temperature. We have been using a Humi-chek in our laboratories for several years and have found that readings obtained with it are never more than 3%-4% different from those obtained with our dew-point hygrometer (to be discussed later in this

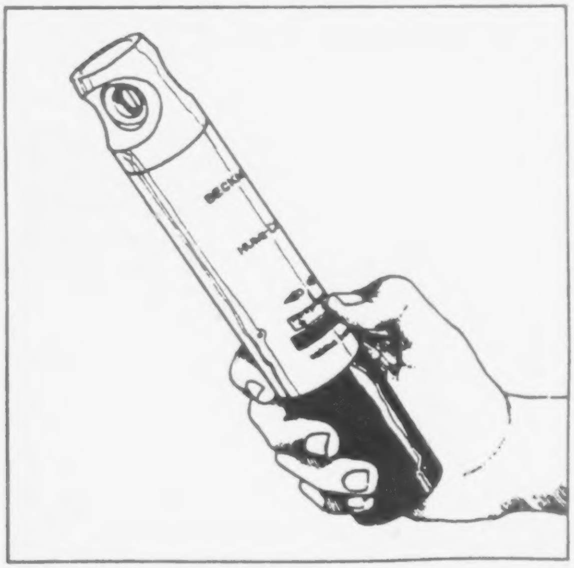

FIGURE 3. The versatile Beckman "Humi-chek". The knurled wheel is rotated with the thumb until two small lights are off. The RH is read directly on the wheel.

bulletin). Indeed, in the range of 30% to 65%, the error was usually not more than ± 3% RH. This is surely quite adequate for most purposes. It does take a few minutes for the instrument to equilibrate to new RH conditions, so one should always wait one or two minutes before taking the final reading.

A more recent version, the Humi-chek II Deluxe, features a calibration adjustment screw and a special calibrator. The latter is placed over the sensing element of the Humi-chek II for a period of half an hour. The instrument is then adjusted to read the correct RH as specified by the calibrator. The cost of the new version is approximately $280, and includes a carrying case and a calibrator.

The "Humeter", produced by Phys-Chemical Research Corporation[5], utilizes a separate sensor and control module (Figure 4). It is semi-portable and operates on 120 volts AC. The price of this instrument is about $1000. It does not outperform the Humi-chek II which costs roughly one-quarter as much and is completely portable. On the other hand, it does offer an advantage in that a recorder can be attached for continuous recording of RH.

The model 400C Humidity Temperature indicator (about $1000) made by General Eastern[6] is similar in design to the Humeter (Figure 5). It is pre-calibrated at the factory, but can be readjusted at regular intervals. This instrument should be accurate for about a year, depending on what type of conditions it is subjected to. Preliminary studies in our laboratories have shown that it could well be used as a reference instrument for calibrating other more inexpensive instruments. Both RH and temperature can be measured and a recorder output is offered.

The Shaw mini-hygrometer[7] (about $500) is small and portable. The dial reading is translated to % RH by reading off a calibration graph; estimated accuracy is ±2%-5%. It, too, suffers in a cost comparison with the Humi-chek. The one we have been using has shown itself to be quite unreliable and inaccurate.

In addition, there are many other electronic hygrometers available on the market. It is advisable to check the specifications carefully before deciding on a purchase. For those who want the ultimate in instrumentation range and accuracy, there are electronic dew-point hygrometers. This type of instrument

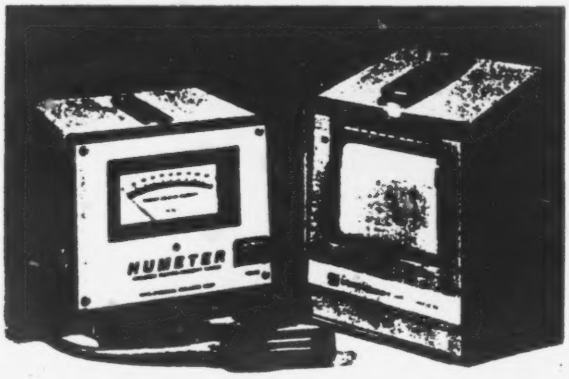

FIGURE 4. Some electronic hygrometers have an output for connecting a strip chart recorder to give continuous readings. The "Humeter" uses a separate humidity sensor.

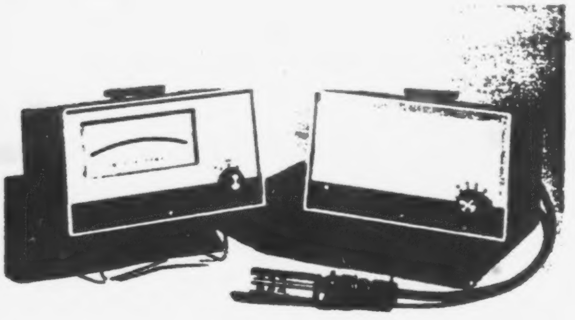

FIGURE 5. The General Eastern Model 400C with multi-probe module. Up to six different sensors can be connected at one time using this special attachment.

measures the dew-point temperature and ambient temperature of the surroundings which, with the use of tables, are converted to % RH. Their accuracy is about ±2% to 3% in the complete range of RH and repeatability is in the ±1% range. However, dew-point instruments are expensive. The "Vapor-Mate II" manufactured by EG & G[8] costs about $3000, and is presently being used in our laboratory with excellent results (Figure 6). Another model, the "Panametrics"[9], is in the same price range.

None of the instruments discussed above give continuous records of % RH by themselves. In some cases, recorder outputs are provided, but the additional cost of a recorder (several hundred dollars) makes this a costly method.

Instruments in another category, which employ the dimensional changes of organic materials with changes in RH, can be conveniently designed to produce continuous records. This type of recording hygrometer (commonly referred to as the **hygrograph**) often also records temperature, and so is called a **thermohygrograph** (Figure 7a).

One popular model uses as its sensing element small bundles of human hair. The length of the hair will vary depending on the RH around it. This motion is transferred by means of a lever mechanism to a pen which draws out a continuous record of RH on a chart driven by a clockwork mechanism. Another model utilizes a special RH sensitive membrane. Most often the temperature is recorded by the use of a bimetallic strip.

The hair thermohygrograph seems to be the more reliable instrument. Belfort offers a model for about $400 which is very easy to use and will record RH and temperature over 7-day or 30-day periods. We have several of these in use and we are satisfied with the results obtained. Every week or month the chart must be changed and ink added to the pens. Every two months or so a wet cloth should be placed around the cage holding the sensing element for about an hour. Applicable to all models of thermohygrographs, this treatment rejuvenates the hair, especially if low RH conditions were encountered during that period of time (Figure 7b). It is calibrated (one day after the wet cloth has been removed) using a psychrometer (Bendix is recommended) or a hygrometer (e.g. Humi-chek) in a RH condition of between 35% and 65% (Figure 7c). It is very important to perform this rejuvenation and calibration if accurate readings are to be obtained. Other hair thermohygrographs are available from Serdex[11], Honeywell[12], Sigma[13], Fisher[2], Canlab[2], Cole-Parmer[16].

The membrane type instrument is available from Serdex, but it is not

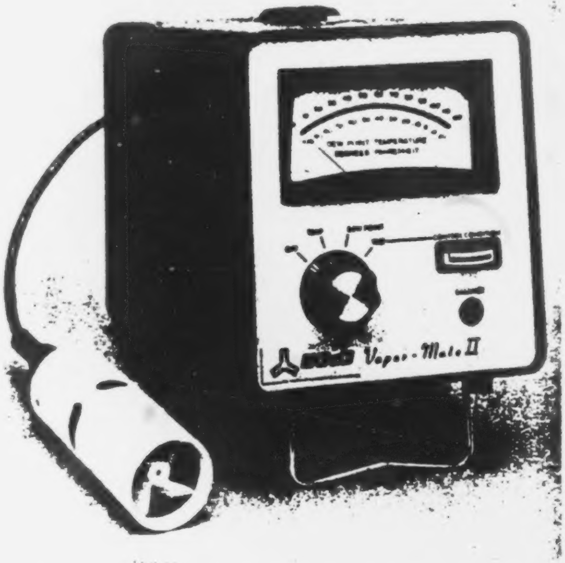

FIGURE 6. Calibration of the EG & G "Vapor-Mate II" dew-point hygrometer is traceable to the National Bureau of Standards. Thus, it is an excellent reference instrument for calibrating others.

recommended because of its considerable inaccuracy in the upper and lower ranges of RH (30% and 70%). The **hysteresis** effect (the fact that the present state of a system will depend on its preceding history or "memory" of previous RH conditions) appears larger with membrane type instruments such as the Serdex. For example, at 50% RH, the Serdex model we tested read 60% if it had been subjected previously to a low RH (approximately 30%) and 49% if subjected previously to a high RH (approximately 70%).

Recording psychrometers are available (e.g. Powers[14]). These tend to be bulky and expensive. They incorporate a motor and a fan for air circulation, as well as a built-in recorder.

It is possible to set up a more elaborate system which can monitor an entire museum building. For example, a sensing element (the type used for the electronic hygrometers) could be placed in each room and these elements connected to a central control module and recorder where the RH of each location would

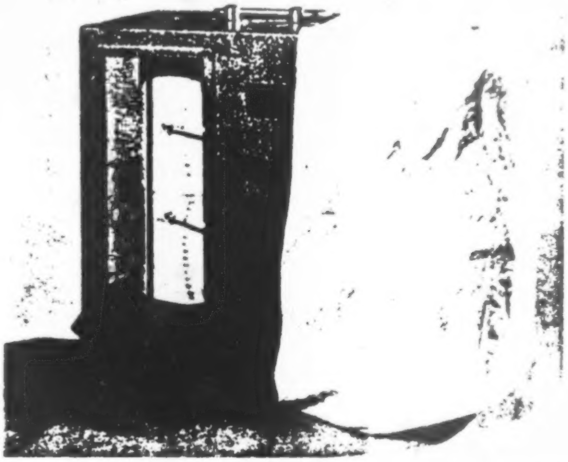

FIGURE 7b. A wet cloth is placed around the cage of the thermohygrograph for about one hour in order to rejuvenate the human hair.

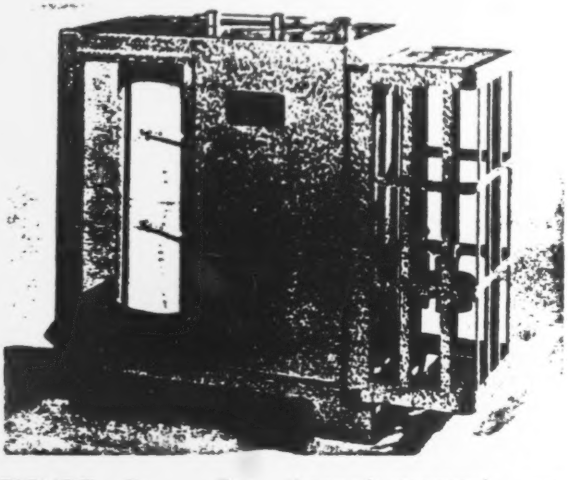

FIGURE 7a. The thermohygrograph can continuously record RH and temperature for 7 or 30 days. Note the round bimetallic strip thermometer and the five bundles of human hair used as the humidity sensor on this particular model.

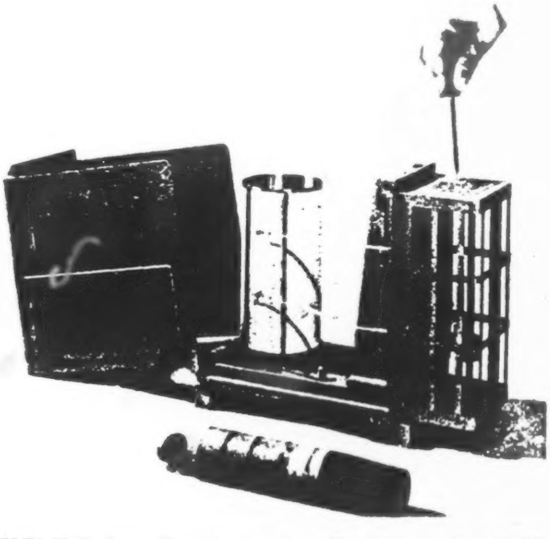

FIGURE 7c. Turning a small screw adjusts the RH reading to give the correct value as indicated by a hygrometer (e.g. Humi-chek). Drum type recorder rotates by a clock mechanism.

be continuously monitored. Such a system can be individually designed by a firm such as Honeywell[12] to meet the specific needs of a particular institution.

Many of the RH monitors we have described have been compared in our laboratories using a controlled humidity chamber. Table I gives a comparison of eight of these instruments. The dew-point hygrometer is taken as the reference value. Sufficient time was allowed for each instrument to equilibrate to conditions inside the chamber. Usually an average of two or more readings was taken.

	% Relative humidity				
Dew-point hygrometer (EG & G)*	11	31	51	80.5	72
Fuess thermohygrograph	7	30	50	-	71
Serdex thermohygrograph	0	22	44	-	65
Amlab hygrometer	24	32	52	-	80
Bendix psychrometer	12	33	54	-	73
Humi-chek	-	30	52	84	-
Humeter	-	36.5	-	83	-
Shaw hygrometer	-	33	-	75	-

TABLE 1. Comparison of RH monitors with standard reference hygrometer.

* Standard reference hygrometer to which others are compared.

3.

Temperature Monitors

Temperature is also an important criterion of museum environment and therefore should be monitored. One should take into account both the ambient (room) temperature and the surface temperature of objects for, although room temperature may be at 21°C (70°F), strong spotlights can raise the surface temperature of artifacts and works of art by many degrees.

Room temperature is best measured by a mercury thermometer or a bimetallic strip thermometer. As was noted earlier, psychrometers and thermohygrographs will also give a measure of the room temperature.

The measurement of surface temperature is not quite so simple. Surface temperature probes can be purchased for this operation. A small unit with two different probes, one for surface temperature and the other for ambient temperature, is available from Aotek[15] for about $200 (Figure 8). Other models can be obtained from Fisher[1], Cole-Parmer[16], Canlab[2], etc., with prices ranging from $100 to $600 (Figure 9).

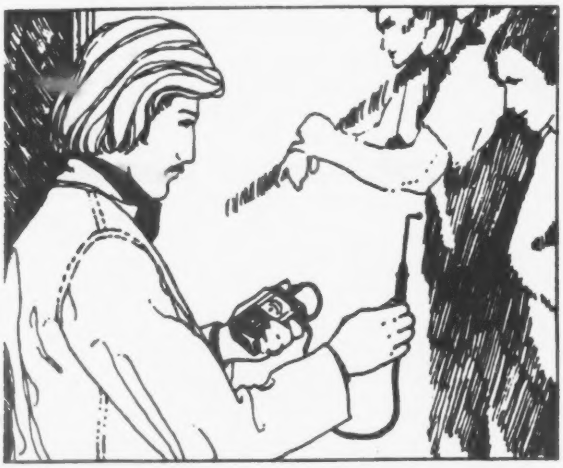

FIGURE 8. Measuring the surface temperature of a painting with the Aotek thermometer. Extreme care is needed so as not to damage the surface of the painting with the probe.

Since with these probes, intimate contact with the surface of the object is necessary, extreme care must be taken when measuring the surface temperature.

There are also instruments which measure surface temperature by utilizing emitted infrared radiation (Figures 10a, 10b). These infrared thermometers are easy to operate, requiring only that the instrument be pointed at the surface and the temperature be read on a scale. Readings from a spot or from broad surface areas and over various temperature ranges are possible.

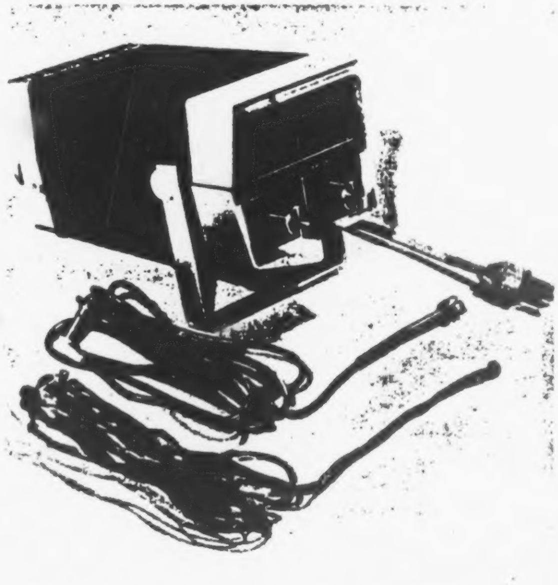

FIGURE 9. The "Digitec" digital thermometer. Both a surface and an ambient temperature probe are shown.

Barnes Engineering[17] and Mikron[18] both manufacture portable units which sell for about $1000. The model we are presently using at the CCI (Barnes Engineering model PRT-10L Portable Infrared Thermometer) has a 2.8° field of view - spot size or measuring area is 3 cm diameter at 30 cm from the instrument, 8 cm diameter at 1 meter from the instrument, 18 cm diameter at 3 meters The temperature scale of -10° to 60°C (14° to 140°F) provides a good working range for our applications. An accuracy of ±1°C is possible. Unfortunately, it is not possible to measure through the glass or plastic windows of display cases.

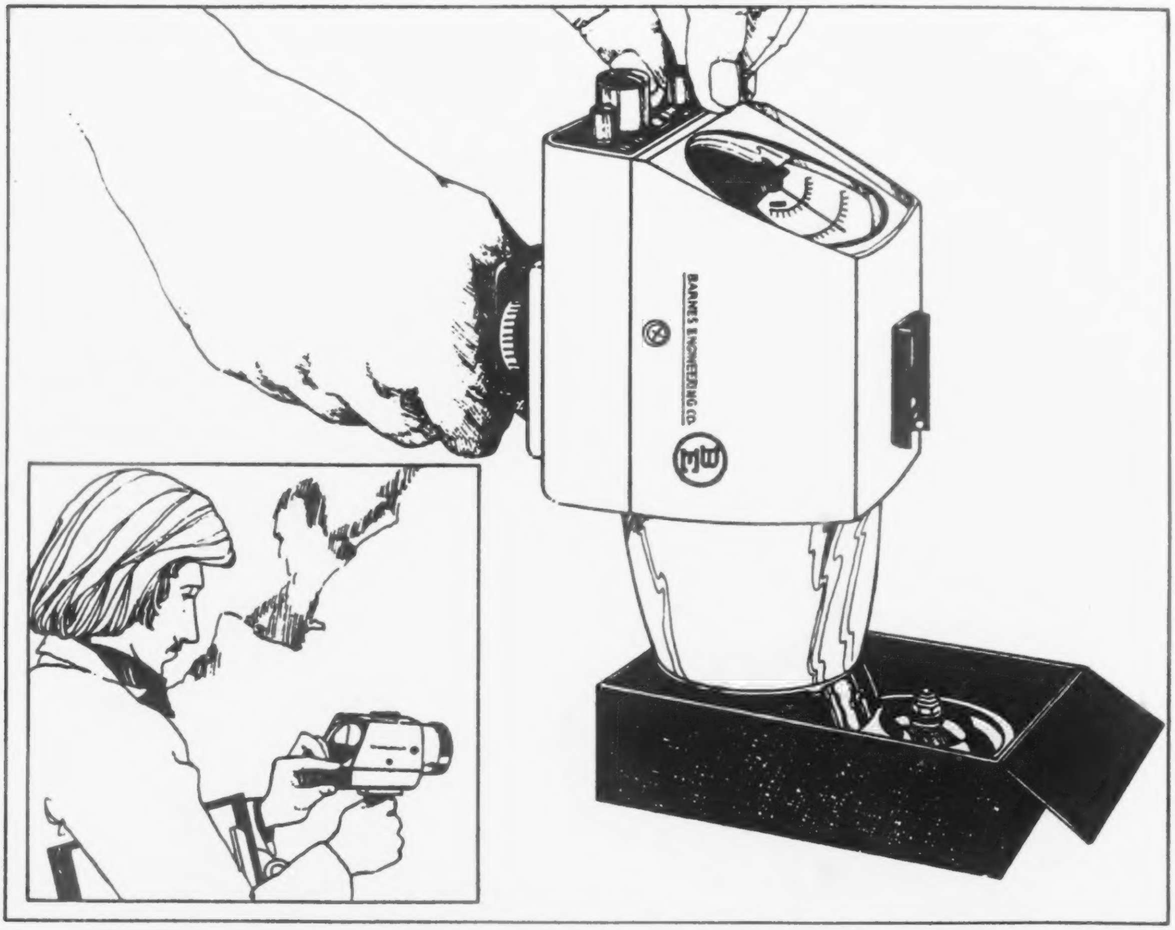
BARNES ENGINEERING CO.

FIGURE 10a. Using the infrared thermometer to measure the surface temperature of a painting.

FIGURE 10b. The Barnes Engineering infrared thermometer being adjusted using a reference surface temperature.

4.

Light Monitors

While it is obviously important to keep lighting at intensity levels that will permit people to observe the objects with little or no eye strain, it is a fact that high intensities are unnecessary since the human eye can readily accommodate itself to lower illuminations.* Recommended lighting levels have been suggested for different types of works of art. The normally accepted maximum values have been set at about 50 lux** for sensitive objects: fugitive pigments, pastels, watercolours, archival materials, both dyed and undyed textiles, etc. For most other objects levels of 150 lux are quite acceptable, although levels of 300 lux may be acceptable for stone and metal objects when fine details are to be viewed. Therefore, it is essential to measure the amount of light in exhibition areas.

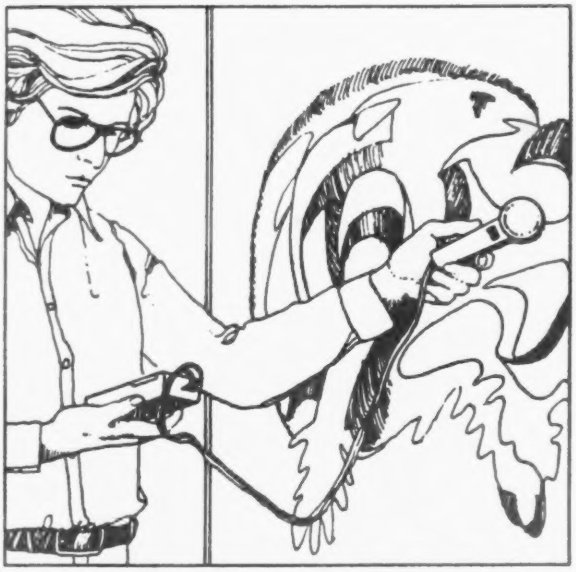

FIGURE 11. Determining the illumination falling on a painting using a Panlux Electronic luxmeter.

Many photometers, luxmeters and foot-candle meters are available (Chauvin Arnoux[19], Gossen[20], Tektronix[21], Gamma Scientific[22]) at prices ranging from about $100 to $1500 (Figure 11). It is imperative that the response curve of these meters be the same as the human eye response (photopic response). Also, one should make certain that the meter is sensitive enough to measure amounts as low as 25 to 50 lux with a reasonable degree of accuracy (10% or better). Some photographic meters are often good only for higher levels of illumination and will not give accurate readings for levels we are interested in determining (50 to 300 lux). Better meters will have accuracies well within acceptable limits, i.e. 10% or better. They usually measure either in lux or in foot-candles. (1 foot-candle equals 10.76 lux.)

Regardless of which instrument is used to measure light intensities, standard procedures should be followed. One always measures the light incident on the object. It is important that the sensor is always in full light and is not, for example, shadowed by a hand or body. For two-dimensional objects (e.g. a painting), the sensor should be parallel to the face of the object. In cases of three-dimensional objects (e.g. sculpture, artifacts), the sensor must be aimed toward the light source. Readings should be taken at different points on the object so that variations in illumination on the same object can be noted.

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* See "A Statistical Survey of Lighting Conditions and the Use of Ultraviolet Filters in Canadian Museums, Archives and Galleries", CCI, the journal of the Canadian Conservation Institute, Vol. 1 (1976), pp. 41-44.

** The lux is a measure of the light level as perceived by the human eye. For details see technical Bulletin No. 2, Museum Lighting, by K. J. Macleod, May 1978, Canadian Conservation Institute.

Since the ultraviolet component of light sources can be responsible for photochemically induced deterioration, it is often necessary to measure the UV energy radiating on a work of art. For this purpose, a UV monitor is needed. Until recently, most instruments of this type were expensive due to the higher cost of producing a sensing element which would respond only to UV and would be sensitive enough to measure the amounts usually encountered in typical lighting situations.

The newly introduced Crawford UV monitor Type 760[29] was tested in the CCI laboratories and was found to be precise and extremely easy to use (Figure 12). For many institutions, a good luxmeter and the Crawford UV monitor are ideal for light and UV measurements, and are less costly than an elaborate radiometer system. Gamma Scientific[22], PBL/International[23], Optronic[24] and United Detector[25] all manufacture more expensive radiometers.

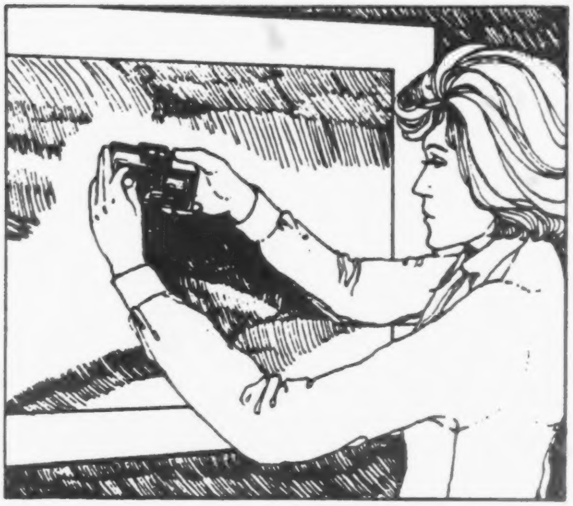

FIGURE 12. Measuring ultraviolet radiation incident on a painting with the Crawford Type 760 monitor.

A Gamma Scientific Model 900 Portable Photometer/Radiometer was tested at the Institute. Two separate detector heads, one for measuring illumination in lux and the other for UV radiation from 300nm to 400nm in microwatts per square centimetre ($\mu W/cm^2$), are used (See Figure 13). Unfortunately, interpretation of the resulting data is sometimes beyond the scope of museum personnel, so this instrument is not recommended.

A less expensive instrument, called a "Black Ray" UV meter, is available from Canlab[2] for about $150. However, its sensitivity is not high enough to measure the amounts of UV ordinarily encountered. It is used for monitoring UV lamps, germicidal lamps, etc., which have high UV output. It is, therefore, not recommended for our purposes.

Whether or not one can afford to purchase UV monitoring equipment, it is essential to provide exhibition and storage conditions which

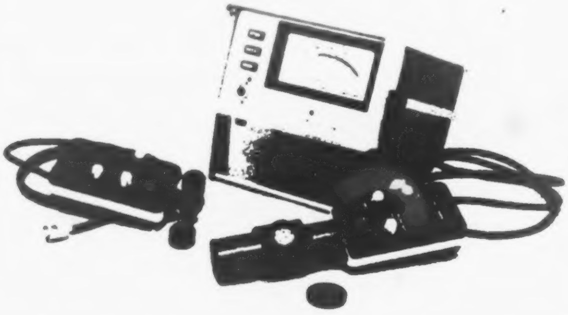

FIGURE 13. Gamma Scientific Model 900. Left detector head measures illumination; the other measures UV intensity from 300nm to 400nm.

minimize the UV component of any illumination. In designing new lighting systems or modifying existing ones, it is important, therefore, to realize that many fluorescent lamps (cool white and daylight) emit roughly 2 to 3 times more UV than incandescent lamps and that daylight contains approximately ten times more UV than incandescent lamps.

Infrared radiation (IR) emitted by incandescent lamps is also a cause of deterioration. It has the effect of increasing the surface temperature of the object it illuminates and so increases the rates of most deterioration processes. Measurement of IR intensity is usually not practical. It is far easier to measure the increase in surface temperature (this has been discussed earlier and will not be repeated here). It is important that surface heating should not exceed a few degrees; excessive surface heating must be corrected by changes in the illuminating system.

There is another method for evaluating safety of the illumination level in a particular installation. Specially dyed textiles are produced for determining the lightfastness of materials. They are made in such a way that the more sensitive standard textile will achieve just "appreciable fading" in half the time needed for the next most sensitive standard to do so, and so on. There are eight such standards:

a) Reference standards nos. 1 to 8 (British Standards)

b) Blue Wool lightfastness standards L2 to L9 (American Standards)

The smaller numbered standards are the most sensitive.

It is possible to obtain an "after the fact" result by using the more sensitive standards and leaving one set on the wall of an exhibition area and another in darkness. Checking periodically will determine if any fading is occurring. The time taken to cause just "appreciable fading" on the most sensitive standard should be noted (i.e. the time it takes for the difference in contrast between the exposed and unexposed standards to become equal to the difference in contrast illustrated by step 4 of the International Geometric Gray Scale which is obtained with the standards).

If the time to cause fading is relatively short (several weeks), then the illumination is too strong. On the other hand, if very little fading takes place over a period of several months, the installation may be considered safe.

As with other types of instruments, lightmeters can be sent to the Canadian Conservation Institute for calibration verification.

5.

Air Pollution Monitoring

The last subject to be discussed is air pollution monitoring. In Canada, fortunately, there are not yet serious problems of air pollution, except perhaps in certain urban and heavily industrialized regions.

It is possible to obtain the levels of pollutants in the air from the National Air Pollution Surveillance monthly summary. This report, compiled by the Air Pollution Control Directorate (Environment Canada), lists daily concentrations of major pollutants in some 34 centres across the country. The pollutants of greatest concern to museums and galleries are sulphur dioxide (SO_2), hydrogen sulphide (H_2S), nitrogen oxide (NO_x) and ozone (O_3).

We feel at this time that it is unnecessary for any institution to do its own monitoring of these pollutants. If an institution believes it has some problems with the air pollutants, the Canadian Conservation Institute can provide a monitoring service for an appropriate period of time. However, for those who intend to carry on some kind of monitoring, there is a wide selection of commercially available instruments. Major scientific companies such as Fisher[1], Bendix[3], Mast[9], Royco[5], Research Appliance Company[28] and Beckman[4] manufacture good instrumentation.

It must be noted that pollutant concentrations in the air usually vary from approximately 0.01 ppm* in unindustrialized areas to about 0.50 ppm in heavily industrialized regions. Since concentrations inside the museum should not exceed approximatley 0.01 ppm, monitors must be able to detect concentrations of 0.01 to 0.02 ppm if they are to be of any value in ambient air monitoring.

There are simple kits for the evaluation of pollutant concentrations which are inexpensive (100 to $150) and are very easy to use. The Bendix-Unico 400 Precision Gas Detector is one example of this type of instrument. However, these are not meant for measuring low levels of pollutants, but are designed for uses such as monitoring inside industrial plants where sulphur dioxide or hydrogen sulphide levels are high due to manufacturing processes. They are useless for measuring levels generally found in museums and art galleries.

* ppm is parts per million

6.

Recommended Instrumentation

Keeping in mind the three categories of institutions defined on page 2, the following recommendations for purchasing equipment are made (Appendix 1). The recommended instruments constitute a "kit" and should be simultaneously available at an institution.

Even with rather inexpensive instruments, much can be learned about the environmental conditions, especially about relative humidity and temperature. These, and excessive light, are still the major causes of deterioration. If certain steps are taken, such as using the simple kits for recording conditions, then it will be possible for the curators and conservators to implement action to prevent damage resulting from humidity that is too high or too low, from extreme temperatures and from intense lighting.

APPENDIX 1: Recommended Monitoring Equipment.

Institution A (low budget)
Relative humidity: Bendix psychrometer ($110) or Humi-chek II ($280).
Temperature (ambient): Bendix psychrometer gives room temperature (dry bulb); if Humi-chek has been chosen, a mercury bulb thermometer or bimetallic strip thermometer should be used.
Temperature (surface): monitoring not recommended; inexpensive equipment is not available.
Light: Panlux luxmeter, made by Gossen (ca. $200).

Institution B (modest budget)
Relative humidity: thermohygrograph (eg. Belfort, $400) plus Bendix psychrometer or Humi-chek for calibration.
Temperature (ambient): thermohygrograph gives continuous temperature readings.
Temperature (surface): Aotek thermometer or similar version available from Fisher or Canlab ($100 to $200).
Light: Panlux luxmeter, made by Gossen; Crawford Type 760 UV monitor ($200).

Institution C (ample budget)
Relative humidity: thermohygrographs which are placed in several locations within museum or art gallery and Bendix psychrometer, Humi-chek or General Electric Model 400C Humidity/Temperature Indicator ($800), or a complete electronic monitoring system (Honeywell) with master control module designed specifically for the institution.
Temperature (ambient): thermohygrograph or monitoring included in a full-scale system.
Temperature (surface): infrared thermometer (Barnes or Mikron).
Light: Panlux luxmeter, made by Gossen; Crawford Type 760 UV monitor.

APPENDIX 2: CCI Field Kit.

The CCI's Environment and Deterioration Research Division has put together an Environmental Monitoring Field Kit using equipment tested at the Institute. The following parameters can be measured with this kit: illumination (in lux); ultraviolet radiation from lighting; relative humidity (two methods); and temperature.

The kit is available on loan from the CCI headquarters and regional laboratories. Instructions included with the kit are written so that untrained personnel can obtain accurate and meaningful readings. However, as this project has been only recently initiated, some unforeseen problems may arise. If this happens, let us know so we can try to remedy such situations for future users of the kit.

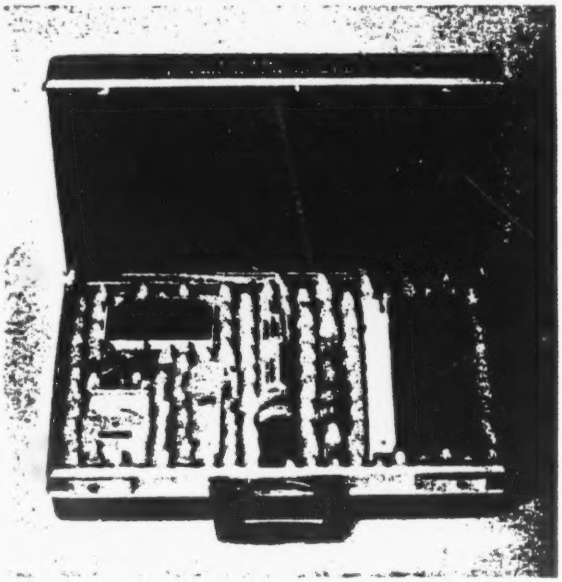

FIGURE 14. Field Kit available on loan from the CCI.

APPENDIX 3: Sample Forms for reporting environmental conditions.

Relative humidity and temperature should be recorded daily at different locations in the building. Since conditions may change during the day, it is also advisable to take measurements at different times throughout one day each week. If continuous records are kept, as with a thermohygrograph, the readings should nevertheless be transcribed on the form at regular time intervals (e.g. every four hours). The instrument used should be identified on the form, and if a particular instrument requires periodic calibration, the date and procedure of the calibration should be noted.

Since artificial illumination does not alter significantly with time, a lighting report need only be done once for a particular exhibition or installation unless deliberate changes in lighting levels are made. However, when daylight is a component of the illumination, then several readings should be made at different times during one day each week in order to take into account the variation in intensities of daylight. The use of filters should also be noted.

When strong spotlights or floodlights are used, the surface temperature of the illuminated object should be measured and compared to the actual room temperature. This is also reported on the form.

Two examples are presented on pages 21 and 22, showing suggested layout of a form for a relative humidity and temperature report and another for an exhibition lighting report.

1 Fisher Scientific Co., Ltd.
outlets in Canada are as follows:

Edmonton
14730 - 115A Avenue
Edmonton, Alberta T5M 3C5
(403) 455-3151
Telex 0372797

Halifax
21 Gurholt Drive
Dartmouth, Nova Scotia B3B 1J8
(902) 469-9891
Telex 01921617

Montréal
8505 Devonshire Road
Montréal, Québec H4P 2L4
(514) 735-2621
Telex 012980

Ottawa
2660 Southvale Crescent
Ottawa, Ontario K1B 4W5
(613) 731-0470
Telex 0533190

Québec
2480 Chemin Ste-Foy
Ste-Foy, Québec G1V 1T6
(418) 656-9962
Telex 0113439

Toronto
184 Railside Road
Don Mills, Ontario M3A 1A9
(416) 445-2121
Telex 06966672

Vancouver
196 West Third Avenue
Vancouver, British Columbia V5Y 1E9
(604) 872-7641
Telex 0453334

Winnipeg
18 Plymouth Street
Winnipeg, Manitoba R2X 2V7
(204) 633-8880
Telex 0757298

2 Canadian Laboratory Supplies (Canlab)
outlets in Canada are as follows:

Edmonton
14104 128A Avenue
Edmonton, Alberta T5L 2M7
(403) 453-3921

Halifax
73 Tacoma Drive
Bank of Commerce Towers
Dartmouth, Nova Scotia B2W 3E7
(902) 434-5380
Telex 01921605

Montréal
8655 Delmeade Road
Mount Royal, Québec H4L 4X7
(514) 731-9651
Telex 0525482

Ottawa
456 McArthur Road
Ottawa, Ontario K1K 4B5
(613) 745-7115

Québec
2299 Versant North Boulevard
Ste-Foy, Québec G1N 4G2
(418) 688-8810

Toronto
80 Jutland Road
Toronto, Ontario M8Z 2H4
(416) 252-5151
Telex 0621893

Vancouver
790 Alderbridge Way
Richmond, British Columbia V6X 2A5
(604) 273-7733
Telex 0454563

Winnipeg
1653 St. James Street
Winnipeg, Manitoba R3H 0X1
(204) 774-1945
Telex 07587631

3 Bendix, Environmental Science Division
1400 Taylor Avenue
Baltimore, MD 21204
(301) 825-5200

4 Beckman Instruments Inc.,
Helipot Division
901 Oxford Street
Toronto, Ontario M8Z 5T2
(416) 251-5251

5 Phys-Chemical Research Corp.
36 West 20th Street
New York, NY 10003
(212) 924-2070

6 General Eastern Corp.
36 Maple Street
Watertown, MA 02172
(617) 923-2386

7 Shaw hygrometers available from:
Pall (Canada) Ltd.
4880 Hickmore Street
St. Laurent, Québec H4T 1K7
(514) 735-5311
Telex 01-20474

8 EG & G available from:
Willer Engineering Ltd.
1800 Avenue Road
Toronto, Ontario M5M 3Z1
(416) 783-3373
Telex 0622151

9 Panametrics, Mast, Royco are available from:
Ralph E. Benner Ltd.
620 Supertest Road
Downsview, Ontario M3T 2M8
(416) 661-9400

10 Belfort Instrument Company
1600 S. Clinton Street
Baltimore, MD 21224

Also available from:
Carleton Instruments Ltd.
2414 Holly Lane
Ottawa, Ontario K1V 7P1
(613) 731-4703

11 Serdex thermohygrographs are available from any Fisher Scientific outlet.

12 Honeywell Controls Ltd.
740 Ellesmere Road
Scarborough, Ontario M1P 2V9
(416) 293-8111 (Head office)
(416) 491-1300 (Sales/Service)

13 Sigma Instruments (Canada) Ltd.
55 Six Point Road
Toronto, Ontario M8Z 2X3
(416) 239-8161

14 Powers Regulator Company Ltd.
2410 Holly Lane
Ottawa, Ontario K1V 2P1
(613) 733-9781

15 Aotek-Frityshing Inc.
1600 Dewey Avenue
Rochester, NY 14615

16 Cole-Parmer Instrument Company
7425 North Oak Park Avenue
Chicago, ILL 60648
(312) 647-0272

17 Barnes Engineering available from:
Ahearn and Soper Ltd.
31 Enterprise Road
Rexdale, Ontario M9W 1C4
(416) 247-7141

18 Mikron available from:
Tubefit Ltd.
109 Eddystone Avenue
Downsview, Ontario
(416) 743-1661

19 Chauvin Arnoux
190 rue Championet
Parie 18e, France 75018

20 Gossen instruments are available from most photographic stores.

21 Tektronix Canada Ltd.
900 Selkirk Street
Pointe Claire, Québec H9R 3S3
(514) 697-9110 (Sales)
(514) 697-9103 (Service)

22 Gamma Scientific available from:
Technical Marketing Associates
3218 Wharton Way
Mississauga, Ontario L4X 2C1
(416) 625-7844

23 PBL/International Inc.
Box 108
Newburyport, MA 01950
(617) 462-8830

24 Optronic Laboratories Inc.
7676 Fenton Street
Silver Spring, MD 20910
(301) 587-2255

25 United Detector Technology Inc.
1732 30th Street
Santa Monica, CA 90404
(213) 396-3175

26 British Standards available from:
CSA (Canadian Standards Assn.)
320 Queen Street
Ottawa, Ontario K1K 1W9
(613) 235-1463

27 American Association of Textile Chemists and Colorists
Box 12215
Research Triangle Park, NC 27709
(919) 549-8141

28 Research Appliance Company products available from:
Hoskin Scientific Ltd.
1096 Victoria Avenue
St. Lambert, Québec J4R 1P2
(514) 672-1754
Telex 0525497

29 The Littlemore Scientific Engineering Company Ltd.
Railway Lane
Littlemore, Oxford, England 0X4 4PZ

Relative Humidity and Temperature Report

INSTITUTION: Week:

Instrument(s) Used:

Date of Last Calibration:

Calibration Procedure:

Day	Time	Room	RH%	Temp. °C	Remarks

Continuous Records Included Yes ☐ No ☐

Comments on Records:

Exhibition Illumination Report

INSTITUTION:

EXHIBITION: Date:

A - Lighting Levels

Instrument(s) Used:

Location	Time	Type of Lighting (Filters)	Light Level (Units)	Recommended Level	UV-Component	Remarks

B - Surface Temperature

Instrument(s) Used:

Location	Time	Object Illuminated	Type of Lighting	Distance from Light Source	Surface Temp.	Remarks

NORTHEAST DOCUMENT CONSERVATION CENTER

Survey Form A
(General)

Place
Address

Date of Survey By

Architecture
Type of building

Roof

Site

Heating System

Air Conditioning (or humidity control)

Building Security
(a) Burglar alarms
Doors
Windows

(b) Fire alarm
Heat sensors
Smoke sensors
Automatic extinguishers
Portable extinguishers

(c) Insurance

Staff

Number

Experience in conservation

Conservation facilities

General Remarks

(This form is used to record data needed to evaluate the building from the point of view of conservation.)

NORTHEAST DOCUMENT CONSERVATION CENTER

Survey Form B
(Conditions in Storage and Exhibition Rooms)

Place

Date of Survey By

Room_______________ Location in building ____________________

Length____ft. Width____ft. Height____ft. Temperature____°F.

Rel. Hum.____ SO_2 penetration__________ Housekeeping__________

Room Contents
stored in

Illumination:
natural:
artificial:
u.v. control:

Heat Arrangement:

Humidity Control:

General Security (theft and vandalism)

Fire Hazards:
electrical:
heating:

Water Risks:
plumbing:______ steam pipes______ building leaks__________

Evidence of:
insects______ rodents______ humidity extremes____________

fungi______ temperature extremes______ photo-chemical

effect____________

Remarks:

(This form is used to record data needed for subsequent evaluation of the rooms in a building from the point of view of conservation. Make a separate sheet for each room in the building.)

Section 3: Protection of Library Materials

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2 East 91st Street New York, NY 10128-9990 Telephone 212-860-6868

BULLETIN NO. 1: BASIC PRINCIPLES OF STORAGE

Whether or not an object will be preserved for the future is most dependent on the kind of storage provided for it. Costly and complicated conservation treatments are of little use if the objects treated are then returned to damaging environments. By providing the best storage possible, we are taking the first and most important step toward preserving our cultural heritage.

The condition of an object depends upon two factors: the materials and methods of its manufacture, and the environment it is exposed to over the course of its lifetime. Most often little can be done to correct the results of inherently poor materials and craftsmanship; much can be done, however, to lengthen the life of an object by controlling its environment.

Ideal museum storage space has climate controls and monitors for relative humidity, temperature, fire, and theft. The space should be closed and accessible only to a limited number of staff members. Within this space, objects should be accessioned, inventoried, and arranged according to a system of organization whether by material, size, or cultural/historical grouping, in storage units fabricated from materials that meet strict conservation standards. In planning storage, no matter how small or large the budget, it is important to keep an optimum system in mind.

Planning:

The primary consideration in planning for storage is the nature of the collection. A collection composed solely of prints or flat works of art on paper, for instance, requires only one type of storage, whereas a collection of artifacts in many media and in various sizes requires a variety of storage units and spaces.

In the planning stage it is important to have a complete record of the collection -- a catalogue, or listing, that is cross-indexed by location, type of artifact, material, etc. While full technical and historical cataloguing is the ideal, the minimum requirement is that every object be assigned a unique and permanent code (typically a number) and be marked with this accession/catalogue number. This procedure clearly establishes the individual identity of each object and makes it possible to keep track of its movements. A museum that has a complete record of its collection can use this data to make an inventory of the types and sizes of objects it owns, and to calculate spatial requirements.

Other variables to consider when designing storage space are whether or not the storage area will house a study collection that is on view to the public; whether or not objects are moved in and out of storage frequently; or whether the museum has one permanent exhibition and keeps the rest of its collection in long term storage.

Location:

A storage facility should be designed so as to exclude the ambient environment. Rapid fluctuations in temperature and relative humidity are particularly harmful to artifacts, especially those composed of organic materials, which undergo dimensional changes with changes in relative humidity and temperature. Storage areas ideally would be located in a central space within a museum building away from outside walls, heating plants, water mains, and daylight. Direct access to related facilities (registrar, loading dock, fumigation chamber, conservation laboratories and curatorial offices) will also contribute to the safety of the objects. Basements and attics are the worst possible locations for storage as they are closest to the exterior of the building and exposed to extremes of relative humidity and temperature; but unfortunately they are often the only spaces available. An understanding of the special problems involved can help make basements and attics better environments despite their inherent dangers as storage space.

Climate Control:

Generally acceptable temperature and relative humidity standards for most museum objects and artifacts are 65 degrees - 70 degrees F (20 degrees - 25 degrees C) at 47-55% RH. It is the museum staff's task to implement measures that will bring the environment into line with these standards.

The best method of controlling the environment is centralized climate control: a system in which incoming air is washed, cleaned, heated/cooled, adjusted to proper conditions, and then injected into the space. The installation of such a system is often a financial impossibility; an alternative is localized climate control. Simple air conditioners will cool the air and absorb some of its moisture while filtering out gross particles; they do not condition the air, nor do they filter air pollutants. There are more sophisticated systems which use activated carbon filters and have humidity controls. To adjust levels of relative humidity and heat, one can use humidifiers (evaporating type) and/or dehumidifiers (condensing type for hot climates), coupled with fans and/or heaters, as well as moisture absorbing wall materials such as sheet-rock panels, fabric, wood panelling, etc. If no funds are available for the purchase of equipment or costly materials, all vents, doors, windows, and passages which allow an exchange of air between interior and exterior could be closed off and locally applicable controls be used.

It is important that all equipment be maintained and cleaned regularly to insure its continuous functioning. A constant environment cannot be maintained if the equipment is turned on and off cyclically.

Lighting:

Light, both visible and invisible, is damaging to most objects. The quantity (level of illumination) as well as the quality (wave length, etc.) of light in storage must be considered. Acceptable levels of visible light are 5 foot candles (50 lux) for highly sensitive objects, usually of an organic nature, such as textiles, watercolors, and paper, and 15 foot candles (150 lux) for moderately sensitive objects like oil paintings.

Natural sunlight can be eliminated from storage areas by closing off all windows in the space, or by covering the windows with heavy black curtains (made from a washable material to facilitate housekeeping). Fluorescent tubes and/or tungsten-halogen lamps within the storage facility must be covered by filters that absorb the ultraviolet component of their light. Incandescent bulbs should be turned on only when people are in the storage area since they generate heat and can create local fluctuations in temperature. Care must be taken that bulbs and lighting tubes are located sufficient distances from objects to avoid fire hazards as well as to prevent deterioration of materials. Lights in storage areas should be turned off when the areas are not in use.

Storage Materials and Methods:

Good storage should be accessible, permit easy movement of objects, and be safe for both objects and persons. Museum collections are usually made up of various types of objects and more than one kind of storage unit and layout is necessary to meet those requirements.

The basic types of large storage units available are cabinets, flat-drawer files, bins, and shelves (either stationary or on casters). Such units are widely used in industry and are readily available in a number of sizes and materials.

If open shelving units are to be used for the storage of artifacts, the shelves must be padded; foamed polystyrene, Ethafoam (Dow Chemical), an open or closed cell plastic, cotton, synthetic felt, or similar materials such as non-glued polyethylene batting, will cushion the objects placed upon them and prevent them from moving in response to vibrations. If wooden shelves must be used they should also be coated with an inert sealer to reduce the migration of acidic material from shelf to object. Some hard woods are acceptable, but oak is not suitable. If plywood is used, only adhesive grade type I with A or B veneer is acceptable. Plastic-coated wire mesh shelving can be used for lightweight objects, such as woven baskets, which require continuous air circulation. Any open shelf unit should have barriers placed across the front of its shelves to prevent objects from falling off.

It is preferable to place smaller or more fragile objects within storage boxes which are housed in shelving units rather than to place the objects directly upon the padded shelves. When choosing a storage box, the rigidity and durability, the composition and buffering quality of its liner, and the ease of opening and closing must all be taken into consideration.

Another option for the storage of small objects is open drawer storage with divided compartments. Flat objects, such as textiles or prints, can be stored in flat-drawer files or in boxes. These objects should be separated from one another by sheets of tissue or placed in individual folders made of paper.

Vertical sliding racks of wire mesh screening or pegboard have been recommended for storage of paintings, mirrors, and other framed objects. As sliding racks require a space twice the length of the screen, they may be impractical in many situations. Another system is a series of narrow wooden or metal slots (large bins close to the floor and smaller bins above). These slots (bins), as well as any cabinets or shelving units, must be raised at least three inches above the floor level to reduce the possibility of damage from flooding. Large pieces, such as furniture or musical instruments, should be placed on raised platforms padded with carpet.

Maintenance:

Even if there is no budget for equipment or supplies, storage can be upgraded through a regular maintenance program. Museum storage must be kept free from dust and other air-borne particles, since that dust attracts insects, is abrasive, and contains mold spores, to mention a few reasons. The ideal method for controlling the amount of air-borne matter entering a storage room is a positive pressure system in which air conditioning keeps the air pressure within the room higher than that of the adjacent rooms.

If storage is furnished with cabinets having tight-fitting (gasket-sealed) doors and curtains or venetian blinds for the open units, and if all vents and windows are sealed, the level of dust and dirt reaching the collection will be minimized (fans can be used for ventilation). Individual objects can be wrapped in neutral tissue or fabric and covered with plastic. This also prevents abrasive dust particles from settling upon them. The tissue or fabric is needed to absorb any moisture trapped within the plastic and to prevent condensation. Storage areas must be cleaned on a regular basis and kept in good repair. When it is time to repaint the walls, a water-based acrylic paint (free of sulphur) should be used.

An important part of a good maintenance program is a record of the environmental conditions. Various types of recorders for humidity and temperature are available. These will be discussed in Bulletin No. 7.

Regular inspection tours of the condition of objects in storage are another important part of a maintenance program. Objects composed of organic materials and metals should be checked periodically for warning signs of environmentally linked problems -- brittleness, discoloration, mold growth, pest infestation, spreading corrosion, etc. Regular checking discourages pests from establishing themselves. Incipient pest infestations should be dealt with immediately with the assistance of a professional exterminator.

Handling:

Standard handling procedure must be followed during condition inspections and whenever objects are moved; only trained personnel should handle collection items. The rules for handling are as follows:

1. No object should be moved from its present location until a space has been prepared to receive it.
2. Heavy, large, or awkward objects should never be moved by one person alone.
3. Padded trays or dollies (for large objects) should be used to transport objects.
4. Anyone moving an object must have clean hands; clean cotton gloves should be worn, especially when handling cellulosic and metal objects.
5. Objects should be grasped with two hands around or below their widest part -- and never by a handle or other narrow protrusion.

Security and Safety:

Museum collections consist of objects having great historic and/or monetary value. If they are misplaced, stolen, or destroyed by fire, they cannot be replaced. Security and fire protection are an essential part of a comprehensive storage program.

Intrusion detection and alarm systems that are sensitive to sound and movement may be installed in storage areas; such systems should be tied in with a central board either at the institution or the local fire and police departments. The least costly method for preventing thefts, however, is to limit access to storage areas. All visitors to storage areas, regardless of who they are, must be accompanied by a staff member. There must be a record of all movement of objects in and out of storage.

Fire detectors of either the thermal, photoelectric, or smoke sensitive varieties should be installed in storage areas. Central, non-aqueous fire extinguishing systems, such as Halon, are desirable in art storage facilities. However, if funds are not available for the installation of Halon, a supervised sprinkler system with a two-zone alarm will protect the building and collection in case of fire, and minimize danger from mechanical failure of the system. Carbon dioxide or dry-chemical fire extinguishers will help only to control a small localized fire or flame and contain its spread. A fire extinguisher can be of value as a protective measure during evacuation and should be placed at a number of locations within the space; the minimum requirement is a fire extinguisher at every exit and entrance.

Most importantly, every institution must have a flood and fire emergency plan. Disasters cannot always be prevented. A well-prepared plan for such occurrences will make it possible to save much material that would otherwise be lost.

Reading List:

Dudley, Dorothy L. *et al.* *Museum Registration Methods* 3rd ed. Washington, D.C.: American Association of Museums, 1979.

Dunn, W.S., Jr. *Storing Your Collections.* A.A.S.L.H. Technical Leaflet 5. Nashville, TN 37203.

Fennelly, Lawrence J. *Museum, Archive, and Library Security.* London. Butterworth, 1983.

Johnson, E. Verner, and J.C. Horgan. *Museum Collection Storage.* Protection of Cultural Heritage. Technical Handbooks for Museums and Monuments 2. Paris: UNESCO, 1979. U.S. distributor BERNAN-UNIPUB, telephone (800) 233-0506.

Keck, Caroline K. *et al.* *A Primer on Museum Security.* Cooperstown, N.Y.: New York State Historic Association, 1966.

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The New York State Conservation Consultancy Bulletin is edited by Konstanze Bachmann, Paper Conservator at the Cooper-Hewitt Museum and Coordinator of the Conservation Consultancy. This publication is funded by a grant from the New York State Council on the Arts.

The above information is generally available and is passed on as a public service, but does not necessarily represent a recommendation or the views of the Smithsonian Institution or the Cooper-Hewitt Museum.

1982/83
1984
1986

PRESERVATION FLYER NO. 5: FOOD AND DRINK

Why is this a Preservation concern?

The presence of food and drink in the library environment creates serious housekeeping problems. Food, even when consumed carefully and neatly, can be left behind in the form of crumbs. Those particles, dropped on carpets or desks, become a staple source of food for insects and rodents. Spilled liquids, too, serve as important life support systems for a variety of organisms. If food and drink are consumed in book stack areas where janitorial attention is less rigorous, the problem is even more serious because no one is likely to notice quickly if there is a sudden influx of pests.

Other common problems associated with food and drink in the library environment are:

1. Cans or cups set on books, often leaving damaging stains and residues which are then easily transferrable to other materials;
2. Chunks of food smashed inside books, obliterating text, damaging paper, encouraging mold growth;
3. Warping and waffling of volumes which have been victims of spillage;
4. Fingerprints on covers and pages, evidence of transferred grease, dirt or even chocolate covered peanuts.

How can these problems be eliminated?

In an ideal library environment, no food or beverage would be allowed into the building. At minimum, they should be strictly limited to designated areas where collections are not housed or processed. Such policy, however, does not address the fact that much damage is done to library materials when they are charged out to library partrons. We can minimize the problems by educating the public on the need to handle our shared collections with care, inside or outside the library.

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SECTION 2: CARE AND HANDLING OF BOOKS

Handling of Books

The conservation of research library materials relies heavily on sound, preventive procedures. One of the most basic of these is the proper handling of books by staff, faculty, and students. Although few research libraries have specific guidelines, there are a number of generally accepted practices that are applicable to all collections. Users can be guided not only by example and educational efforts, but also by the willingness of staff to speak up when they see abuse of books.

There are a number of preventive conservation measures involving the handling of books that are part of responsible collection care and management. It is helpful for all staff involved, including students, to receive training in shelving and retrieving procedures, the proper use of book ends, supports, and book trucks, and the location of special shelving areas for unusual formats such as folios. Understanding how a book should be handled and opened, stress factors on books, care in pocketing, plating, and stamping, and the need for concern in displaying volumes in exhibits are considerations to be covered.

A general understanding of basic conservation will help research library personnel deal with the diversity of handling problems they will encounter, including those caused by photocopy machines, book drops, and food. It will enable them to be aware of items that require preservation attention and to route them to the proper destination. Additionally, staff need to be cognizant of the misuse of rubber bands, string, paper clips, pressure-sensitive tapes, rubber cement, and highlighting pens. Each individual library may have special problems that suggest specific mention or training because of unique collections, peculiarities of buildings, or requirements of readers. The following will enable staff to contribute to the conservation of all the collections:

1. Knowledge of the proper shelving of books, with consideration of size and format.
2. An awareness of the damage caused by pulling at the headcaps of volumes.
3. An awareness of the proper use of book ends to support volumes without damage.
4. An awareness of damage caused by use of photocopy machines. Posters and clearly marked instructions can help remind staff and patrons. Photocopiers that allow books to be copied while open to a 90- or 100-degree angle (with the glass to the edge) will help prevent damage.
5. An understanding of why eating, drinking, and smoking are not allowed in any stack areas.

6. An understanding of the damage caused by paper clips, rubber bands, or other objects left in books.

The library can also take steps to prevent damage to books by:

1. Locking bookdrops when the library is open and emptying them often.
2. Providing readers with plastic bags when it rains.
3. Placing date due slips, bar codes, or other labels to which pressure is applied during charging procedures on the text block and not on the inside cover boards so strain on the hinges can be avoided, or training circulation staff to provide support for the cover board before stamping.

Resources

Books, Pamphlets, Articles:

Association of Research Libraries. Office of Management Studies. Basic Preservation Procedures. SPEC Kit 70. Washington, DC: ARL, 1981.

Preservation documents from many libraries.

Buchanan, Sally A., and Walter Henry. User's Guide to the Conservation of Library Materials. Stanford: Stanford University Libraries, 1980.

A nine-page booklet detailing basic techniques of book handling and related concerns in library conservation.

Darling, Pamela. "Books in Peril; A Local Preservation Program: Where to Start." Library Journal 101 (November 15, 1976): 2343-46.

Basic and practical advice on book handling as well as other basic preservation considerations.

Sugden, R. P. Care and Handling of Art Objects. New York: Metropolitan Museum of Art, 1946.

A somewhat dated but still instructive book that includes information on handling rare books.

Audiovisual Aids:

Harvard University Library. [On the shelving and handling of books at Harvard.] (Two trays, one cassette, $40 loan.)

Contact: Doris Freitag, Conservation Office, Harvard University Libraries, Cambridge, MA 02138.

Nebraska State Historical Society. "Storage and Handling," 1981. (A slide-tape show with 93 slides, cued tape, 13 minutes, free.)

Contact: Conservation Specialist, 1500 R Street, Lincoln, NE 68508.

Newberry Library. [On the care and handling of books at the Newberry.] (One carousel, one cassette, one script, free.)

Contact: Conservator, The Newberry Library, 60 West Walton Street, Chicago, IL 60610.

University of Wisconsin Library, Madison. [On the shelving and handling of books at the University of Wisconsin.] (One carousel, one cassette.) Madison, WI.

Vincent-Daviss, Diana. "The Enemies of Books." Dobbs Ferry, NY: Condyne/Oceana Group, 1980. (3/4" video cassette, no loan, $95 purchase, made at the New York University Law Library.)

Yale University Library. "The Care and Handling of Books." (One carousel, one cassette, $20 loan.)

Contact: Conservation Department, Yale University Library, New Haven, CT 06520.

Stack Maintenance

The size of most long-established, major research library collections and the variety of resources contained make stack maintenance an impressive challenge. Housekeeping and refurbishing are two matters of critical importance to an overall preservation effort. Staff may inadvertently follow practices damaging to the books, journals, manuscripts, and other documents housed in stack areas because of ignorance, lack of supervision, or lack of proper supplies.

General Housekeeping

Dirt, aerosols, and air pollutants all contribute to the deterioration of library materials. The following steps will help control the problem.

1. An air filtration system is an important part of any efficient environmental control system. See the specifications on the environment for further information.

2. A daily visual inspection of all stack areas by library staff can prevent or minimize damage through early detection of problems.

3. Periodic, thorough cleaning of stack areas is necessary to keep dust and dirt to a minimum. This cleaning should include floors, tops of cases, overhead pipes, and light fixtures (be sure to replace UV filters when tubes are changed).

4. Cleaning staff must be carefully instructed so that they do not inadvertently damage materials. A training program on book handling is recommended. Careful supervision of staff using cleaning liquids and treated dust cloths is advisable.

5. Vacuuming to remove dust is beneficial, but extreme care must be practiced if the books are to be vacuumed. A cheesecloth filter and soft bristle brush should be used in this case (see Horton).

6. If windows are not sealed shut, they may need to be screened to avoid access by birds and animals.

7. Food should never be allowed in stack areas since it will attract insects and other vermin. Eating, drinking, and smoking should be restricted to lounge areas far removed from shelving.

8. Fire detection and alarm systems are essential in providing a structural environment aimed at protecting library materials from disaster. Careful evaluation of fire extinguishing systems is required. The best sprinkler systems are of the "pre-action system" design, which contains no pressure unless activated by smoke. Halon, a gaseous suppressant, does not damage library materials but is expensive for large areas. Carbon dioxide also poses little threat to library materials but can be dangerous to humans.

Periodic fire and electrical code inspections are routine for the responsible administrator.

9. To protect the library from water damage, it is important to inspect regularly and maintain roof areas and their drainage systems, internal and external. Thorough and periodic inspection of plumbing, sanitary drainage systems, and heat or steam piping is also essential. Installation of a water-alert system is advisable, particularly in basement areas or in areas without internal drainage.

Refurbishing

A refurbishing program in the stacks is a good general maintenance routine that will help prevent insect infestation and dust build-up and will provide the necessary upkeep for many shelved items. Refurbishing programs often include the following activities:

1. vacuuming books (see fifth bullet above) and vacuuming, wiping, and/or washing the shelves;

2. replacing acidic envelopes and/or pamphlet binders;

3. removing foreign objects and acid slips from books;

4. noting items in poor condition for later processing;

5. tying or bagging deteriorated books as an interim measure;

6. relabeling; and

7. treating leather bindings (note: This activity must be carefully supervised since some animal skins should never be oiled -- see the Library of Congress and Horton references).

Resources

Duckett, Kenneth W. Modern Manuscripts: A Practical Manual for their Management, Care and Use. Nashville: American Association for State and Local History, 1975.

Chapter 4 is an excellent introduction to housekeeping and other preservation problems of manuscripts.

Horton, Carolyn. Cleaning and Preserving Bindings and Related Materials. 2nd ed. Library Technology Program Publication No. 16. Chicago: American Library Association, 1969.

Describes a stack maintenance program that includes the vacuuming of books and their refurbishing.

Kathpalia, Yash Pal. Conservation and Restoration of Archive Materials. Documentation, Libraries and Archives: Studies and Research, No. 3. Paris: UNESCO, 1973.

Although geared to the tropics, this volume has a broadly applicable overview of housekeeping practices and procedures.

Library and Archives Conservation. The Boston Athenaeum's 1971 Seminar on the Application of Chemical and Physical Methods to the Conservation of Library and Archival Materials, May 17-21, 1971. Edited by George Cunha and Norman P. Tucker. Boston: Boston Athenaeum, 1972.

Pages 121-129 have a good discussion of housekeeping procedures.

Library of Congress. Preservation Office. Preserving Leather Bindings. Preservation Leaflets 3. Washington, DC: Library of Congress, 1975.

Describes a program of leather oiling and upkeep with cautions and directions.

MAINTENANCE OF LIBRARY MATERIALS

The hundreds of thousands of individual dust-collecting items in libraries, plus all of the dirt catchers normally found in large public buildings, make housekeeping difficult. Regular cleaning personnel rarely understand the extra importance of cleanliness in libraries. In order to keep ahead of the overwhelming amount of dust and dirt continually being introduced into library buildings and archives, it is necessary to establish and rigidly supervise daily, weekly and monthly cleaning schedules. Every area in the building must be included, with labor allotted to each space in proportion to its exposure. All too frequently staff cleaning personnel, or industrial cleaners hired on a contract basis, are required only to maintain the public areas and office spaces (which even then get only perfunctory floor moppings and emptying of waste baskets) permitting vermin attracting environment to build up elsewhere. In all probability in many libraries the book stacks never receive any cleaning attention until the situation is in extremis. Valiant attacks on the book-destroying conditions are then too late, for damage will have been done by then.

The emphasis in the daily routine should be on the prompt removal of dirt introduced through open windows, unscreened ventilators, and brought in by staff personnel and readers. Books should be cleaned with a vacuum cleaner or a compressed air gun under an exhaust hood, rather than by dusting. In 1969, ionized air guns were introduced to aid librarians and archivists in their never-ending problem of the control of dust. (1) These compressed air guns, with built-in static eliminators, spray conductive air over materials being cleaned to remove more completely the accumulated dust. Other static eliminating devices are available to reduce the dust collecting electrical charges on books, document boxes, storage cabinets, shelves, etc. Formalin or other disinfectants should be used in all cleaning water; trash should never be allowed to accumulate; and snacks and beverages should be strictly prohibited except in designated dining areas. Instructions for weekly cleaning should prescribe getting behind cabinets, under desks, into remote corners, etc. to remove all dirt and refuse which could sustain insects. If at all possible, cleaning policy should schedule each area of the building for a thorough overhaul at least once a year during which every vestige of soil and dirt is removed from walls, ceilings, shelves, etc., as well as the books themselves. At the same time, maintenance personnel should inspect (and take necessary corrective action) for leaks in water and steam pipes, evidence of moisture from leaks in the walls and roof, ensure that basement floors are dry and that cracks and holes in the foundation, particularly around sewer pipes, water and gas mains, etc., are plugged with waterproof cement.

Excellent instructions for routine cleaning of books are also available in Carolyn Horton's Cleaning and Preserving Bindings and Related Materials. (2) Librarians would also do well by heeding the guidance promulgated for the cleaning of book storerooms (books and book stacks) by the U.S.S.R. State Library, Moscow, (3), (4) and (5), parts of which are here reprinted:

"These regulations must be observed by all book storerooms of the library. It is the duty of the section heads in charge of book collections, and of the librarians directly responsible for the books, to see that they are observed, and the Department for the Care, Preservation and Restoration of Books (DCPRB) must ensure proper supervision. Cases (conditions) which are a potential danger to the preservation of the collections must be immediately reported to the Director's Office.

"The ventilation in book storerooms should ensure the access of dust free air, and its efficient circulation throughout the storeroom. If ventilation is effected by means of windows or air vents, these should be screened by gauze or by a fine net, to keep out the dust of the street, especially in the summer. If mold is found, the books should be handed over to the Department for the Care and Restoration of Books.

"Cleanliness in book storerooms should be ensured by sweeping the premises daily. Dust and litter should be removed from the floors, vacant shelves, furniture, and ventilation gratings, etc. Linoleum covered floors should be wiped with damp rags dipped in 2% formalin.* Stone or cement floors should be swept with brushes wrapped in damp rags.* Parquet floors are best vacuum-cleaned. Washing floors raises the air humidity and therefore the existing air humidity in the storeroom must be taken into account before any washing is carried out.

"Books should be vacuum-cleaned at least twice a year, and the book racks wiped with 2% formalin solution.

When new stocks are introduced, or when book collections are being generally relocated, the racks and the cupboard shelves should also be wiped with a 2% formalin solution.

"The supervision of the cleanliness in book storerooms, and of the correct sweeping of the premises and dusting of books, is the responsibility of the DCPRB.

"It is absolutely prohibited to bring foodstuffs, glue (paste), or other substances which attract insects, mice or rats into book storerooms. If rodents appear in the storeroom, the premises must be immediately disinfected.

"It is forbidden to store books on the floor or piled up.

"Books stored in closed cabinets should be aired every day.

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* Editor's Note - Dry floor mops treated with "Endust", The Drackett Company, 5020 Spring Grove Ave., Cincinnati, Ohio; or "Super Hil-Tone Dressing", Hillyard Chemical Company, St. Joseph, Missouri, will clean well but will not simultaneously disinfect as will the formalin treated cleaning cloths.

"The premises of book storerooms should be under technical supervision. Strict measures should be taken to ensure that the roof, water pipes, drains and heating system are kept in good repair. Any current repairs and maintenance must be carried out immediately. The Heads of Departments and (the chief conservator) should be given adequate notice of any technical work to be carried out in the storeroom by the Technical Department or by the Group for Building Repairs.

"The inspection of book collections in order to detect unserviceable books and to separate them is one of the most important and compulsory measures needed to ensure the preservation of book collections in libraries.

"The inspection will detect books which are dirty, mold infected, or infested by insects, and also very old books. These are removed from the general stock.

"The worker engaged on book inspection in the storeroom must: (a) take each book off the shelf; (b) inspect not only the outside of the book, but also a selected number of leaves, in particular the first and the last, and then replace the book on the shelf if no evidence of damage is detected; (c) insert an acid-free bookmark of the DCPRB into infected or very old books and replace them on the shelf as well.

"The bookmarks for the DCPRB are of two kinds: 'To Book Care Section' and 'To Book Restoration Section'. The bookmark in very old books sent for restoration should be of a difference color from that placed in books sent to the book care section.

"The following books should be isolated: (a) moldy books, showing mold stains and deposits; (b) books damaged by insects, showing round and oval holes in the cover and in the leaves; these are the worm holes of the larvae of book pests; (c) books with leaves stuck together; (d) damp books, and books which are dry but which show evidence of past dampness; (e) books with friable, broken leaves.

"The dusting of books involves the following operations:

1. The books are taken off the shelf and placed on a small table.

2. The book is then dusted by wiping the edges, spine, and cover or dust jacket. The dusting of the book should start at the upper edge of the spine; the side edge is then cleaned with a downward motion, then the bottom edge, then the spine itself; the covers are cleaned last. The

movement of the hand along the edge should always be away from the spine. One tampon (cotton swab) is sufficient for the cleaning of several books, depending on how dirty they are, if its soiled surface is replaced by clean cotton wool from inside the tampon. The tampon is used until completely soiled, and is then placed in a covered bucket.

3. After the books have been cleaned, they must be replaced on the shelf in the proper order in accordance with their catalog numbers.

4. The sequence of the dusting should be from the upper to the lower shelves.

5. The soiled tampons should be removed and burned every day.

Since most libraries have no more cleaning personnel than are necessary to keep the offices and public areas presentable, there are alternative solutions. For instance, the manuscript division at the Library of Congress keeps one man fully employed at cleaning books and book shelves, oiling leather-bound volumes, and doing simple repairs. Operating with a library cart carrying cleaning supplies and equipment, he moves from row to row and stack to stack, keeping tens of thousands of bound volumes in clean and serviceable condition.

When it is impossible to provide even one full time book cleaner, consideration should be given to the use of students or volunteer help for occasional cleaning of selected areas. One library's procedure is to set up a working space to which the books from the area selected are temporarily removed for cleaning by student employees who are available during the summer. The walls, floor, ceiling and shelving in the emptied space are scrubbed with detergents, following which everything is painted. After this, if there has been any evidence of vermin, insecticides are painted or sprayed in the cracks and crevices and in other areas normally blocked by the books. Before the books are returned to the shelves, they are individually vacuum cleaned and inspected for evidences of mildew and other damage. Then the leather-bound volumes are treated with potassium lactate and a good dressing; vellum covers are cleaned carefully with saddle soap. The pages of any books with traces of mildew are sprayed with a 5% solution of thymol in alcohol. Books that show other signs of chemical or physical damage are set aside for further repairs. Here are sample standing instructions for cleaning crews:

Cleaning Procedure For Book Stacks

1. Remove books from shelves one rack at a time and place on shelves in the work area. KEEP IN ORDER.

2. Thoroughly vacuum clean and scrub with detergent the shelves and racks. Also the floor, walls and ceiling adjacent to the racks.

3. With a vacuum cleaner thoroughly clean the exteriors of each book. THEN;
    a. For leather-bound volumes*
        1. Carefully clean preliminary pages, the end sheets and interior pages as necessary.
        2. Inspect for mildew, treat with Thymol ** as necessary.
        3. Clean covers with saddle soap.***
        4. Sponge covers with 7% aqueous solution of Potassium Lactate. Let dry for 24 hours.
        5. Apply a leather dressing. Let stand for 24 hours.****
        6. Polish leather with flannel cloth.
    b. For vellum-covered books
        1. Clean exteriors and interiors, check for mildew and treat with Thymol if necessary as for leather books.
        2. Clean covers with saddle soap.
    c. For cloth-bound volumes
        1. Clean exteriors and interiors, check for mildew and treat with Thymol as necessary as for leather books.

4. After a whole rack of books has been cleaned, return them to their original shelves in the same order as they were removed.

* This treatment every 24 months will preserve new leather and leather that has not deteriorated to the point of powdering. Please note: This is not as basic and straight forward as it first appears. Consult with a conservator for instructions before beginning.

** When there is evidence of mildew, spray with a solution of Thymol 10% in ethyl alcohol.

*** When leather is powdering, skip steps 3 and 4.

**** An easy to make, easy to apply dressing that penetrates deeply into the leather fibers and dries without tackiness is a mixture of lanolin (6 parts) and neatsfoot oil (4 parts) melted together over mild heat.

References

1. Nuclear Products Division, 3M Company, St. Paul, Minn. 55101. (Ionizing air guns).

2. Horton, Carolyn. Cleaning and Preserving Bindings and Related Materials. Chicago: American Library Assn., 1969. Library Technology Program No. 16.

3. "Requirements for the Preservation of Book Collections in the Book Storerooms of the Lenin State Library", Collection of Materials on the Preservation of Library Resources. Moscow: U.S.S.R. State Library, 1963. English translation available from National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22151.

4. "Instructions for Inspecting Book Collections" (ibid).

5. "Instructions for Dusting Book Collections and for Leaf-by-Leaf Treatment of Damaged and Dirty Books" (ibid).

6. Cunha, G.M. and D.G. Cunha. Conservation of Library Materials. Metuchen, New Jersey: The Scarecrow Press, 1971. Page 101 ff.

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rev. 2/81

Maintenance-6

5.0 NOTES ON PRESERVATION

A comprehensive preservation program includes preventing damage to materials as well as treating materials as they become deteriorated. The following notes provide information and guidelines on how to prevent damage. They should assist all library staff in the proper care and maintenance of the collections. Further detail on topics dealt with in these "Notes" may be requested from the Preservation Department (x2223). All staff are encouraged to suggest additional topics for inclusion in this section.

5.1 SHELVING

Proper shelving can greatly extend the useful life of library materials. Unnecessary damage can be prevented by recognizing destructive shelving practices that cause the breakdown of a book's binding structure. Volumes incorrectly shelved and handled give way to stresses that can permanently warp bindings, tear a book from its cover, crack spines, and crumble brittle pages. Attention to good shelving practices and keeping shelves neat goes a long way toward preserving our library collections and encouraging users to follow our good example.

5.1.1 REMOVING VOLUMES FROM THE SHELF

Do not pull a volume off the shelf by the head cap of the spine. Push the two volumes on either side of the desired volume back slightly, leaving the book free to be grasped solidly.

Tilt out the first volume in a tight row by placing a finger on the top of the book and tipping forward far enough to grasp the volume.

Push in bookends after a volume is removed to keep remaining books straight.

Large volumes shelved flat should be removed one at a time and placed on a table for use.

Use a step stool to reach high shelves.

5.1.2 RESHELVING

Shelve books vertically, in an upright well-supported position. Make sure each row of books is straight and supported by a bookend.

Place books too tall for the shelf spine down, but avoid volumes projecting out into the aisle.

Shelve oversize volumes flat, ideally one to a shelf, but not more than three. Provide consultation space near the shelving area.

Fasten securely all portfolios and boxes protecting fragile materials.

Before reshelving, dust books to remove damaging dirt and set aside for review volumes needing repair.

5.2 CLEANING BOOKS AND STACK AREAS

Particulate matter, dust, soot and dirt is an unending threat, especially in New York City. Dirt is more than an unsightly nuisance; it can abrade book materials, and introduce destructive chemicals which hasten deterioration.

Whenever sections are being shifted, dust each volume before placing it on the new shelf. In addition, establish a regular cleaning cycle aimed at working through the entire collection every three to eight years (depending on the size and value of the collection, local dirt conditions, and use patterns). This thorough cleaning should include removal of every item, cleaning shelves and each volume. If possible, use a small vacuum cleaner with soft-brush attachment and use Endust-treated cheese cloth. Do not use the mineral oil-impregnated cloths provided to the Facilities staff. Work from the top shelf down, exercising extreme caution in handling brittle items. During this process, damaged or deteriorated volumes can be identified for treatment. Units undertaking a cleaning program for the first time should consult the the Preservation Department.

Eliminate foreign materials from the stack area. Food, drinks, and smoking apparatus should never be permitted around shelves. Shelf labels should be of the type which fit into brackets on the front-edge. If tape must be used, be sure it does not extend above or below the edge of the shelf; this is necessary to keep the adhesive from the books.

5.2.1 KEEPING OPEN STACKS NEAT

The natural tendency is to leave things as they are found, or more so. If books are haphazardly sprawled on shelves, users are likely to be casual about handling them. But if they're upright in neat rows, users will tend to keep them that way, and may even straighten up a toppled row if it is a conspicuous exception to overall neatness. Give enough time to straightening and cleaning to create an overall impression of care for the books so that readers will be inclined to perpetuate the arrangement.

5.2.2 STAFF FOR SHELF MAINTENANCE

To accomplish all these things, one person should be given specific responsibility for the appearance of the shelves; in a large stack area, this responsibility may be divided, by area, among two or more assistants. A crash program of straightening up may be easily combined with re-shelving, shelf-reading, weeding, etc. The responsible person should have these notes as a guide, and should be encouraged to suggest major shifts, rearrangement of shelves, requests for more book-ends, etc., as appropriate.

5.3. MICROFORMS

Microforms have their own specific requirements for proper handling and storage. Safeguards against mishandling will prevent unnecessary wear and tear. Microforms are easily scratched and torn if not handled correctly. Because of the heavy use of microform service copies in libraries, the more rigorous archival standards established for the storage of master negatives are impractical. However, since repair and replacement of any library materials are both costly and time consuming, all efforts at proper care and handling will help to extend the useful life of microforms. Supplies mentioned below are available from CUL Supply Room or the Reprography Laboratory.

5.3.1 HANDLING

Clean, well-maintained reading equipment can prevent damage to film. Dust and dirt on glass flats scratch and abrade the emulsion obliterating the image. Clean equipment regularly and keep lens housing covered when not in use.

Handle microfilm only by the edges or by the leader; and fiche by the header. Fingerprints leave oils and acid on the surface which blur the image and attract dust and dirt.

When working with a large quantity of microfilm or fiche, use white cotton gloves to avoid fingerprints or scratching.

Tears that are spotted should be repaired before the film goes to the shelf. Further damage can occur when torn film is used on a reader. Torn film can be repaired by the Reprography laboratory staff using splicing equipment. Pressure sensitive tape should never be used to repair tears. Film with extensive damage (where text is lost) may need to be replaced.

Roll film should have adequate leader and trailer for easier handling (at least 18" of blank film at each end). Users will be able to load reading equipment more easily, preventing damage from fingerprints. Leader and trailer can be spliced to film by the Reprography staff.

5.3.2 STORAGE

Microfilm should be stored on plastic reels, in closed boxes. Metal reels with sharp edges should be replaced with plastic; damaged or worn boxes should be replaced to keep out dust and dirt that can scratch film.

Remove all rubberbands on microfilm reels. Sulfur in rubberbands causes chemical reactions that damage film; and even sulfur-free ones can damage.

Full reels of microfilm will stay neatly wound by themselves; shorter titles that tend to unwind should be secured with paper wrap-arounds available from the Reprography Lab (x4884).

Rewind microfilm reels firmly but not too tightly. Film wound too tightly may buckle or scratch and film can stick together when temperature and humidity are high.

Microfiche are best stored in individual paper envelopes. This provides protection from dust, dirt, and abrasion. Remove any plastic wrappings or rubberbands for storage. Filing without envelopes is not harmful if temperature and humidity are kept low to prevent the sheets from sticking together.

5.3.3 INSPECTION

All microforms being added to the collection should be visually inspected for completeness, overall appearance, and readability. Some of the problems to watch out for are:

-- blurry image
-- deep scratching
-- too light or too dark image
-- anything that causes the image to be illegible
-- missing or out of order pages, issues, etc.

The Reprography staff is available to help confirm these problems.

Microforms produced outside the Reprography Lab with problems of image quality as well as any bibliographic anomalies should be brought to the attention of the Acquisitions Department. Unacceptable microforms should be returned for refund or replacement. Micropublishers that show repeated problems should be identified so they can be avoided in the future.

5.4 CONSCIOUSNESS-RAISING AMONG PATRONS AND STAFF

5.4.1 USER AWARENESS ITEMS

Consciousness-raising bookmarks, stand-up sign and photocopying poster designed by the Preservation Committee are available from the Preservation Department. Please request supplies as needed.

5.4.2 AUDIO VISUAL PROGRAMS

Audio-visual programs from various libraries are available through the Preservation Department. A department may contact the Preservation Department for a training session on any aspect of preservation.

5.5 DISASTER PREPAREDNESS

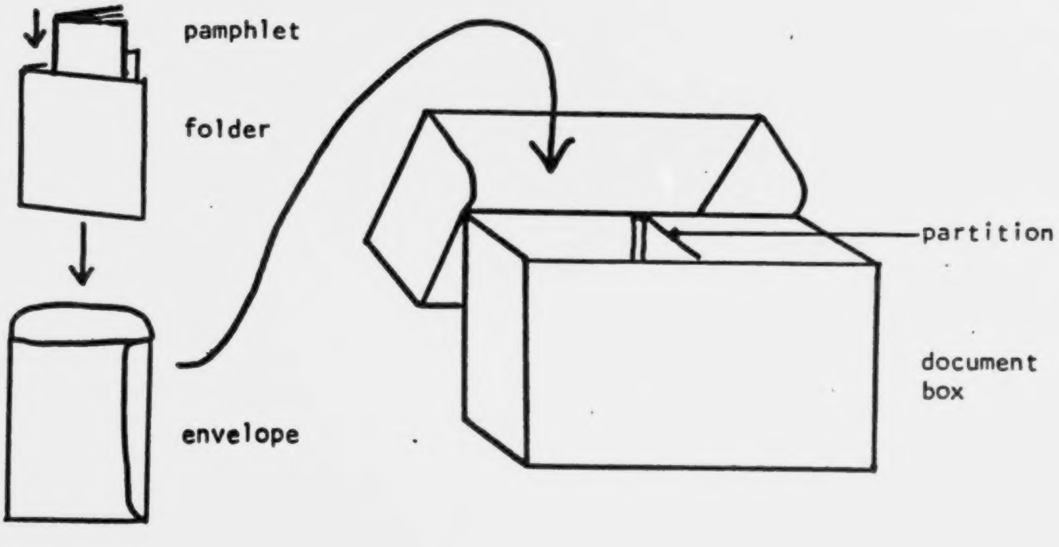
The Disaster Preparedness Plan is available in every department of the library. It is in a red binder and should be accessible to all staff. It is the responsibility of the Preservation Department to come to your aid in a disaster situation and the Head of the Preservation Department should be notified immediately. Please become familiar with the Disaster Preparedness Plan.

CCAHA CONSERVATION CENTER FOR ART AND HISTORIC ARTIFACTS
260 SOUTH BROAD STREET
PHILADELPHIA, PA 19102 (215)545-0613

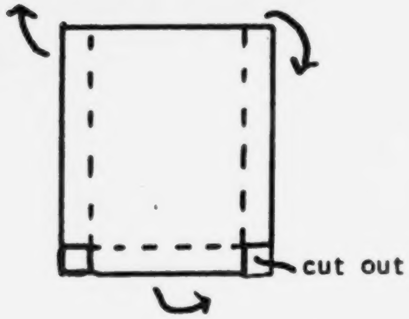
PAMPHLET STORAGE SYSTEM

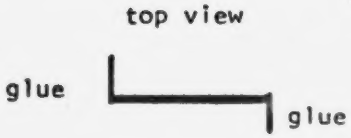
This storage system allows pamphlets to be safely stored and retrieved for use with a minimum of handling. The system utilizes acid free buffered materials available from several archival supply companies. Each pamphlet is placed in a standard size precut folder which is inserted into an envelope. The envelope can then be shelved with the books or placed with other envelopes in a document box shelved separately. The folder supports the pamphlet and allows it to be safely and easily inserted into the envelope. The envelope contains the folder and pamphlet and protects it from dirt and handling. The document boxes proved secure, clean storage and easy retrieval.

To implement the system, first choose a range of standard size, acid free buffered envelopes; choose those with side seams (rather than center) and a protective flap at the top. Use map folder stock or permatan (bufferd .010 inch or .020 inch heavy paper) to cut folders to fit each size of envelope. The folders should fit the envelopes securely but be easily withdrawn. The envelopes can then be labelled and stored upright on the shelves with the books if this is appropriate to the collection, or stored in document boxes. The document boxes should be chosen to fit the standard size envelopes or partitioned so the envelopes are held securely upright.



Partitions can be made from the same stock as folders. Cut the partition 2 inches wider and one inch longer than the end dimensions of the document box. Then cut one inch by one inch squares out of the bottom corners. crease along the dotted lines in the directions shown in the diagram so that the flaps are at right angles to the partition.





Cover the outside surface of each flap with PVA emulsion (Jade 403, available from TALAS). Insert the partition into a pre-marked location in the document box and press the flaps securely against the bottom and sides of the box to achieve good adhesion. Allow to dry for 30 minutes before handling.

Excerted from the forthcoming "Preservation of Library Materials: A Manual for Staff." Module 1. Scheduled for publication November 1987.

PRESERVATION GUIDELINES FOR PROCESSING STAFF

The General Libraries

Preservation Committee

Austin
1986

1. PRESERVATION GUIDELINES FOR PROCESSING STAFF

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PRESERVATION GUIDELINES FOR PROCESSING STAFF

The success of library preservation programs at The University of Texas at Austin depends upon the cooperative efforts of the entire staff, including everyone who processes library materials. This manual is intended to provide staff in the Bibliographic Control Division and other processing areas with a heightened awareness of library preservation needs and correct methods of handling the material they process and transport so that all unnecessary damage can be avoided.

A. OPENING MATERIALS

It is essential that care be taken in opening packages, cartons, or materials tied together for transport, whether they come from outside the university (from jobbers or publishers) or are sent from within the university.

1. Use of tools

If an X-acto knife, scissors or other sharp utensil is used to open a sealed package, use it carefully to avoid gouging the materials inside.

2. Handling and inspection

damaged books

Handle materials carefully while removing them from the package, examining them for damage or defects which may require returning a book and requesting replacement, or sending the book to Book Repair. Some categories of damaged books are easily identified. Books with loose **hinges** where the **text block** sags, with severe water damage, with damaged or loose **spines** or **covers,** and with loose pages are some of these obvious categories. An example of a defective book is one which has been bound upside down.

Do not attempt the repair of a book unless you have been trained by the Book Repair Unit staff in making repairs. Otherwise refer damaged volumes to Book Repair.

B. TRANSPORTING MATERIALS AMONG THE PROCESSING AREAS

Handle and transport books carefully. Improper loading and removal of books from book trucks is one of the most frequent causes of damage to library materials and potentially the most preventable if all personnel learn proper handling and transportation techniques.

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

1. Hand carrying

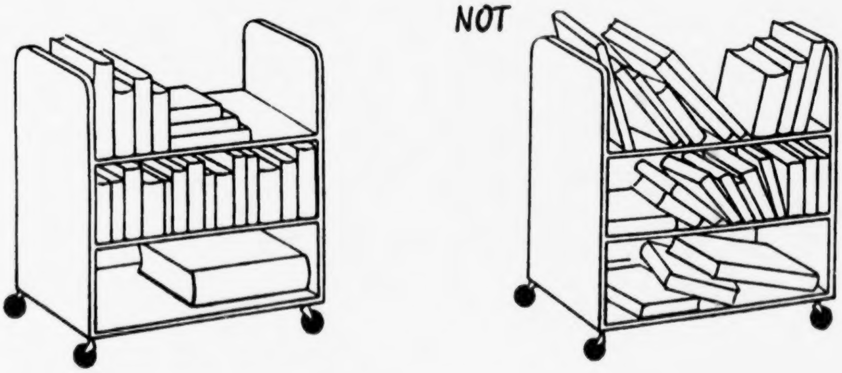
When hand carrying books, carry moderate armloads.

hand carrying

2. Book trucks

Place books on trucks in an upright position with no other materials stacked on top of them. If a shelf of a truck is only partially full, keep books vertical with a book end or with a group of books laid flat to support the others. Do not place them on their **fore edges** even for a short period of time - as for example when arranging them in call number order - since this can cause the body of a book to come loose from its **covers.**

Large **folio** volumes should be placed flat on a shelf.



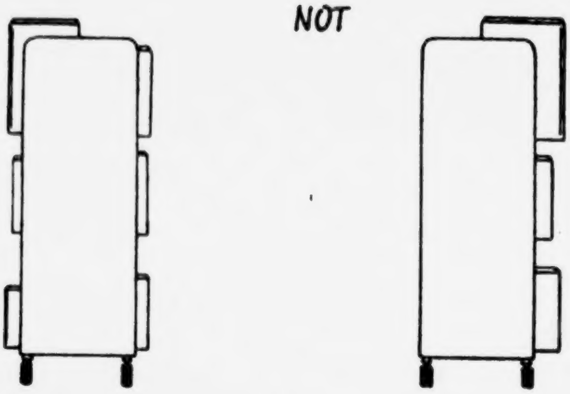
Transporting unbound materials on book trucks requires special consideration. Unbound materials with some rigidity can receive proper support through use of **Princeton-files** or book ends. Unbound materials with little rigidity would easily fall over or down even if conveyed in such files or with book ends; they should be placed flat in small neatly stacked piles in order to prevent them from easily slipping off the truck.

unbound materials

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

balancing weight on trucks

Two other important points to remember when loading a truck are not to overload it and to evenly distribute the weight. Do not jam books too tightly on the shelf. Even, balanced distribution and normal-sized loads make the truck easier to manage and prevent it from tipping over.



maneuvering trucks

Move book trucks carefully on and off elevators, around corners, and in narrow passages, paying special attention to any material which may be protruding. Let your supervisor know if an elevator is not stopping evenly or if a truck seems wobbly or unstable.

Refer also to section C., SHELVING

3. Unloading book trucks

Many of the above instructions should also be followed when unloading. Refer also to the next section on shelving.

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

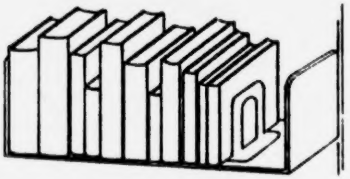
C. SHELVING AND STORAGE OF MATERIAL

As materials move through the processing units, they remain in a variety of shelving/storage environments, sometimes on a long-term basis. In order to avoid damage to the materials, it is essential that some basic storage techniques be adhered to. The same principles should be applied whether materials are stored on an individual shelf beside the cataloger's desk or are shelved in Twelve-Month Hold in Automated Cataloging on a long-term basis.

1. Position and placement of books

proper position of books

Place a book on the shelf so that it stands vertically and upright and is gently supported by the books on either side, additional support being supplied by book ends. Books should not be shelved too loosely. They can be permanently bent or splayed if this is done.



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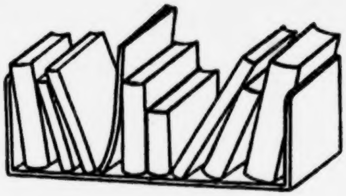
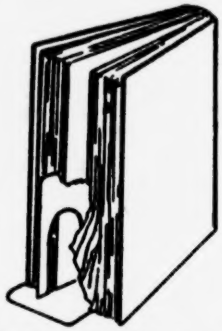


overcrowding

Jamming books too tightly on the shelf should be avoided. Overcrowding can create problems in the easy removal of books from the shelf. Binding damage can also result.

book ends

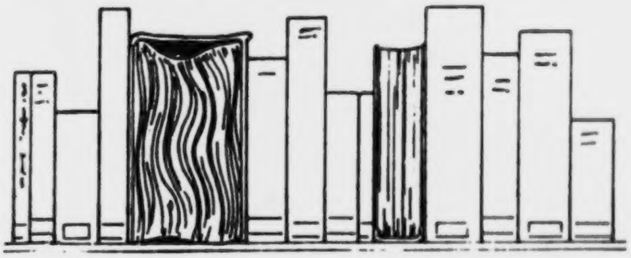
Library book ends should be free of sharp or rusty edges. When possible, they should support over half of the height of the book and should have a wide profile. When shelving near a book end be careful not to accidently "knife" the pages of the book with the edge of the book end. Report the need for more book ends or other book end problems to your supervisor.



Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

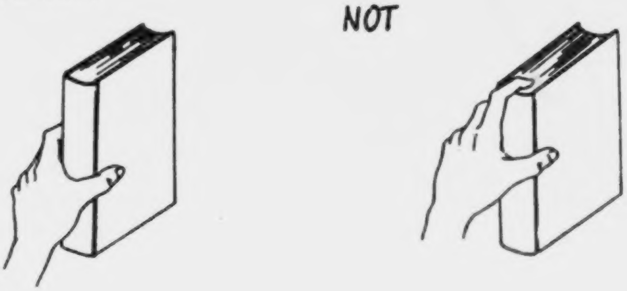
Fore edge shelving is unacceptable since it can cause the **book block** to loosen from its **case** . If a volume is too tall to shelve vertically, it is preferable to shelve it on its **spine** rather than on its **fore edge.**

fore edge shelving is wrong



When removing a book from the shelf never pull it by the top of the **spine,** since this might cause **headcap** damage. Rather the two adjacent volumes should be pushed back slightly in order to grasp the book firmly for removal.

removing a book



2. Oversized volumes

It may not be possible to stand oversized volumes upright or to provide separate oversized shelving areas in all processing areas. If this is the case, oversized volumes should lie flat, no more than three deep on the shelf, on shelves deep enough to support them, or they should be shelved on their spines. Very large tomes, such as those found in art studies, should always be shelved flat.

shelving position

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

When removing an oversized book from the bottom of a stack, the books on top should be removed one at a time, and afterward put back in the same manner.

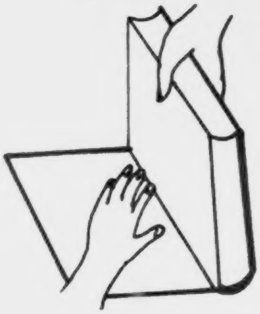
removing a volume

3. Opening new books

Careless opening of a new book, or a newly bound book, can crack its **spine.** Books bound in plastic are especially prone to having tight **spines.** All staff who need to open a tightly bound book, and most especially staff engaged in cataloging, where the book must be opened for examination of content, should use the proper technique to encourage the book to open easily.

With the book on its **spine** on a flat surface, and the **text block** held upright, open the front cover and run the fingers gently along the **hinge.** Do the same to the back cover, followed by both front and back **end sheet** pages. Then, altering front and back until the entire **text block** is completed, open small sections of pages, applying the same gentle pressure along the **hinge** while holding firmly the remaining **text block** in an upright position.

method of opening



D. HANDLING MATERIALS DURING PROCESSING

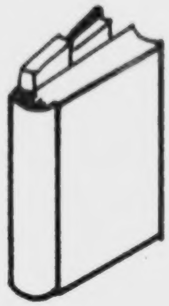
All staff should be aware of books as physical objects and be concerned that no processing routine or practice interferes with the preservation of these items and accessibility to the information they contain. The more staff members know about proper care and handling of books, the less accidental damage occurs.

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

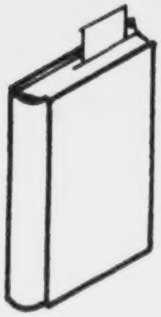
1. Inserts

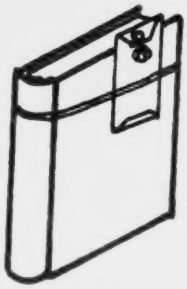
bulky packets

Various kinds of enclosures are inserted into books going through processing and often these enclosures collect into packets that become quite thick or bulky. Jamming packets of cards, order forms, invoices, flags, etc., inside the cover or **text block** of a book, tightly against the **hinge,** can strain or break a binding which has been custom made to fit the thickness of the book's **text block.**



A thin packet may be placed in the center of the **text block,** away from the **inner margin.** Thick or bulky packets should be placed as appropriate between, on top of, or in envelopes alongside of the books to which they relate.





Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

2. Detachable sheets in books being bound

Books going through the binding process require attachments of order and binding forms as well as colored sorting codes in many cases. Such attachments and permanent markings should never be placed directly onto the pages of the book. Instead a separate acid-free sheet of paper, gummed and perforated along one long side, is inserted and attached in the front of each book to hold such glued-in forms and sorting codes. This sheet is bound into the book.

detachable sheet to hold processing instructions

After processing is completed, these sheets are detached along the perforated line and discarded. Any forms from this sheet which must accompany books to their final destination outside processing areas are inserted into the center of the **text block.**

3. Marking in books

All markings directly applied to books should be either in pencil or printed on gummed labels. If in pencil, information is to be written using a soft lead pencil, such as a No. 2, and then using only the minimum of pressure necessary for legibility. Placement of pencil marks and labels should be as unobtrusive as possible and should never obscure printed or visual information.

pencils or labels not pens

Pens or other similar permanent writing tools are inappropriate for marking processing instructions directly into books.

Library ownership and date received stamps should be applied with proper support given the **spines** and **text blocks** and placed so that printed and visual information is not obscured. Too much ink on a stamp can ruin a **cover** or page of a book.

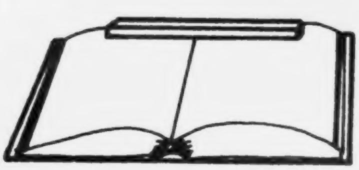
ownership stamps

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

4. Keeping books open during cataloging

keeping books open

Although a properly bound book should open flat and remain open, many books won't cooperate and require some effort to keep them open. During cataloging or other processing activities, a **book snake,** book stand or sheet of Plexiglass should be used when it is too awkward to use just hands. Never use a weighty object such as another book because of the damaging stress which the weight exerts on the **spine** of the open book.



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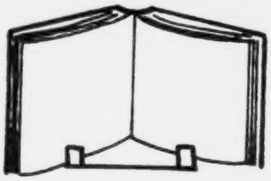

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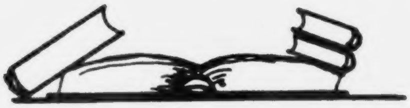


5. Office supplies

Paper clips and rubber bands are common office supplies which damage books when improperly used or left in place too long.

paper clips

Paper clips are very handy but pages of books often show signs of their use--crimped pages, tears, and rust marks. Most processing slips inserted into the center of the **text block** will stay there during processing if the book is handled properly. Paper clips should be used as little as possible and must be carefully removed when their function is complete. Paper clips should not be left on volumes to be placed in Twelve-Month Hold in Automated Cataloging or onto other long-term processing holds in the library.

rubber bands

Rubber bands are another problem, as they can bend or rip pages and **covers.** A long-term effect, as the rubber band rots, is a sticky, damaging residue remaining on the book. Rubber bands should therefore not be

Definitions for terms **bold-faced** in text can be found in the GLOSSARY at the end of this manual.

used to secure together unbound materials or books going onto Twelve-Month Hold in Automated Cataloging or onto other long-term processing holds in the library. To secure together unbound or hold materials use cotton tape (preferred) or string tied with a library knot. See page 1.15 of this manual for instructions on how to tie this knot.

Do not use rubber bands to send any materials through campus mail.

Staples mutilate pages of books and should therefore never be used.

staples

6. Uncut pages

Occasionally books arrive in the library with pages that have not been cut. For those that need to be bound, the pages will be cut before binding. For already bound books, library staff, not users, should cut the pages by holding the book partially open, and with either a metal letter opener or bone folder cutting the top and **fore edges** with very short strokes, taking care not to saw back and forth through **foldings.** Holding the **text block** flat with a free hand will help avoid uneven cutting of pages. If more than a few pages need cutting, refer the volume, after end processing, to the Book Repair Unit.

method of cutting pages

7. Photocopying

Photocopying can easily damage books by putting undue pressure on **spines** as they are bent back to lie flat on the glass screen. If the paper is brittle, this will crumble or break the paper at stress points.

Many machines found in the libraries are not meant to copy facing pages in bound books. When necessary therefore, photocopying should be done carefully by inverting the book, gently placing it atop the glass screen, covering the book with the machine flap, and copying. Apply no more than light pressure to the **spine.** Accept a less than perfect copy if the alternative would mean pressing books flat.

careful positioning

Definitions for terms **bold-faced** in the text can be found in the GLOSSARY at the end of this manual.

E. CARE AND MAINTENANCE OF PROCESSING AREAS

Staff in every library processing area share responsibility with custodians and others in maintaining a proper environment for material which they process and which may be stored in their work areas for various periods of time.

1. Regulating environment

Be alert for environmental factors which might be harmful to books. Leaky pipes, water stained ceiling tiles, excessive room heat, and unshaded windows that result in direct sunlight on the books should be brought to the attention of your supervisor.

facilities problems

Roaches, silverfish, and other insects can be a problem in libraries. If insect damage becomes apparent the supervisor should arrange through the Facilities and Support Services for an exterminator to come. Alert your supervisor when insects are observed in processing areas.

insect damage

Since food attracts insects and can stain books, any food or beverage consumed in work areas should be consumed carefully and the work areas kept clean and neat.

food and drink

Greasy or dirty fingerprints are often impossible to remove from the pages of books. Clean hands are an important part of preserving books.

fingerprints

2. Maintaining equipment

Shelves and their bracing should occasionally, at least annually, be checked for looseness. Some shelving arrangements are kept at tension by diagonal guys which have a tendency to loosen over time, causing shelves to sag or lean.

loose shelves

Definitions for terms **bold-faced** in the text can be found in the GLOSSSARY at the end of this manual.

GLOSSARY

Board - The hard part of the book cover. The book has a front and back board. (see illustration, page 1.14.)

Book snake - A snake-shaped bean bag used to hold books open without forcing them flat and putting undue stress on the spine.

Book block - see **Text block**

Case - The cover of a case-bound book. A book is case bound when the **cover** is made separately from the **text block,** and later attached to it by means of **end sheet** and **super.**

Cover - see **Case**

Endpaper - see **End sheet**

End sheet - A sheet of durable paper, half of which is glued to the inside of the **cover,** and the other half of which is free, making a page. The **end sheet** is the first thing one sees when one opens the **cover.** To it are usually affixed the coding and date due slip. (see illustration, page 1.14.) Also called **endpaper.**

Foldings - A general term referring to printed sheets which have been folded to form sections.

Folio - The largest size of book, with a height of over 18 inches.

Fore edge - The edge of the book opposite the **spine.** (see illustration, page 1.14.)

Headcap - The top of the **spine.** (see illustration, page 1.14.)

Hinge - The juncture of the **spine** and **boards** of a case-bound book.

a. Torn **hinge** - The book cloth has torn along the juncture.

b. Loose **hinge** - The book cloth has come unglued from the **super,** or the **end sheet** and **super** have come unglued from the **board.**

c. Broken **hinge** - The **board** has entirely separated from the **text block.**

Inner margin - The margin of a printed page which is nearest to the fold of the section. Also called the gutter margin.

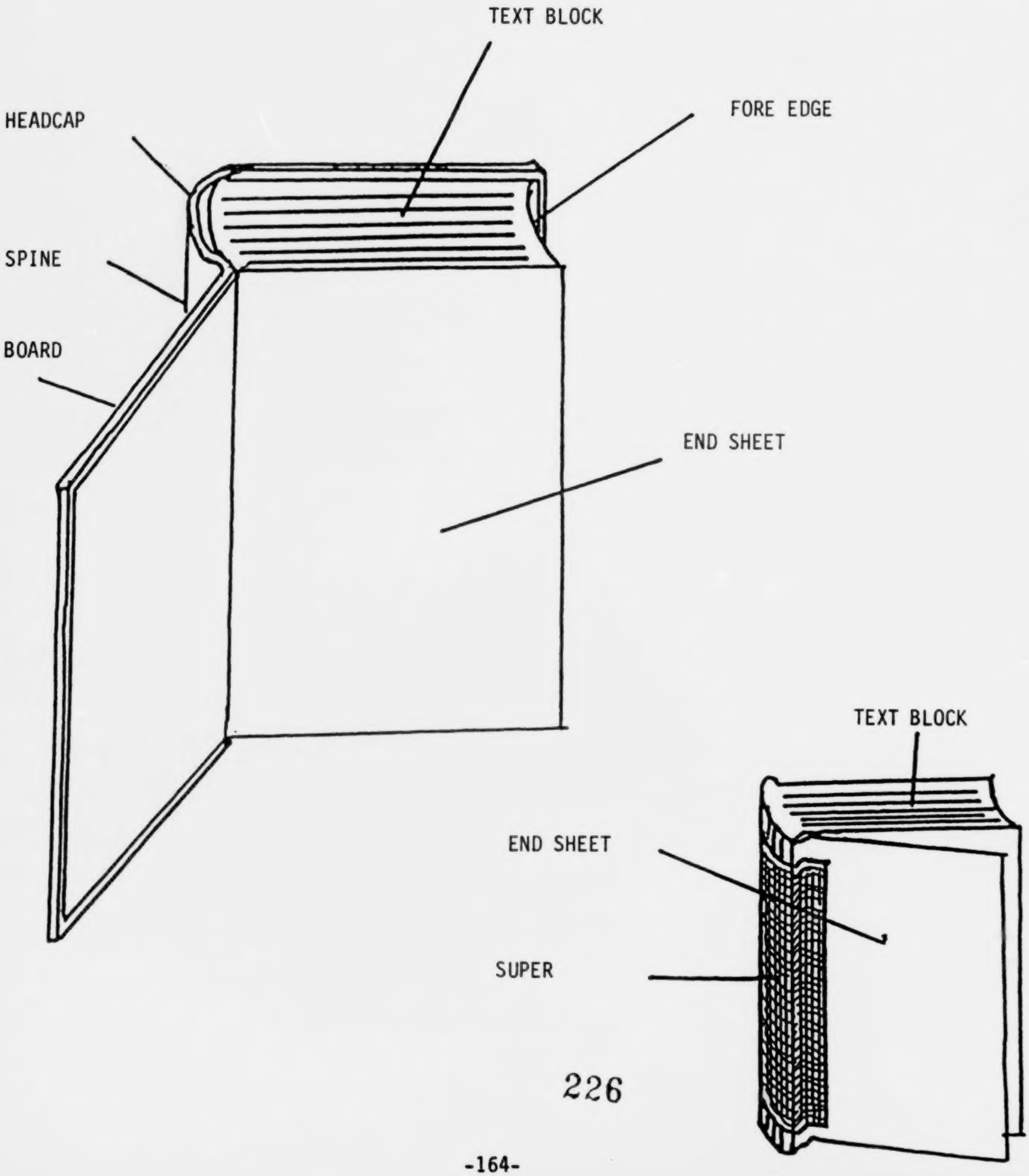
Princeton files - A free-standing box file which is open at the top and back, and which has a front securing the upper parts only of the sides of the file, deep enough to take a large label.

Spine - The edge of the book that faces outward when the book sits on the shelf. The backbone of the book. (See illustration, page 1.14.)

Super - Unbleached cotton mesh, or muslin cloth, glued over the sewing of a book, and covering part of the **end sheet** near the **spine.** (see illustration, page 1.14.)

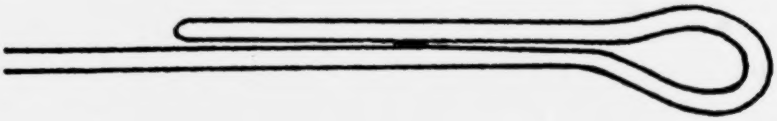
Text block - The part of the book formed by its pages. The **text block** is attached to the **cover** by means of the **end sheet** and **super.** (see illustration, page 1.14.)

PARTS OF A BOOK


TEXT BLOCK
HEADCAP
FORE EDGE
SPINE
BOARD
END SHEET
TEXT BLOCK
END SHEET
SUPER

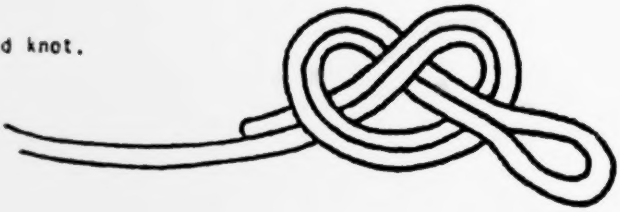
226

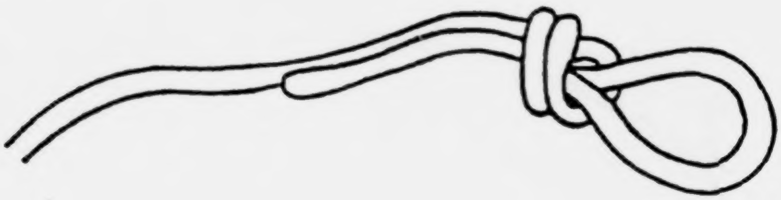
The Library Knot



① The best tying material is cotton tape, but medium weight string works well also. Take enough tape to wrap around the book three times the long way. Double about four inches at one end . . .

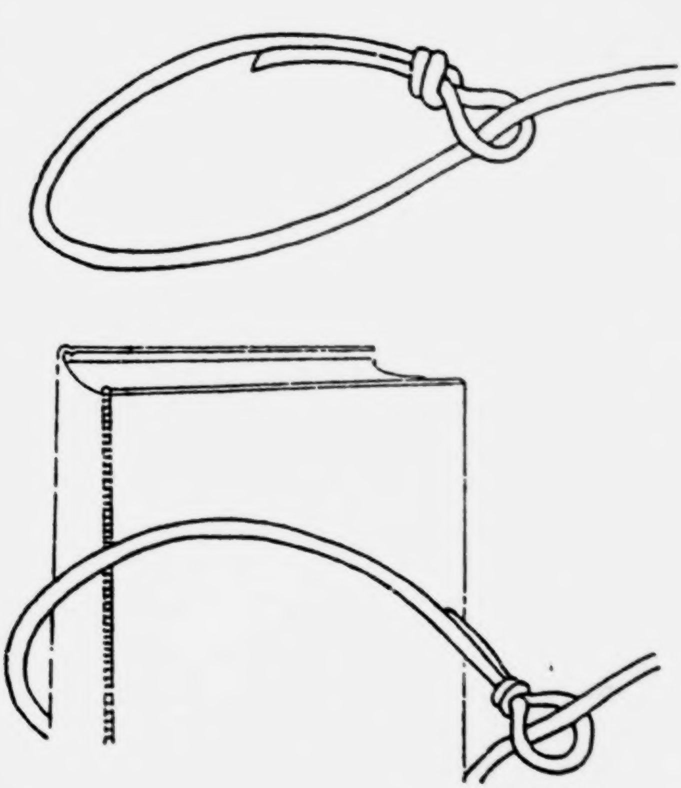
② and form an overhand knot.

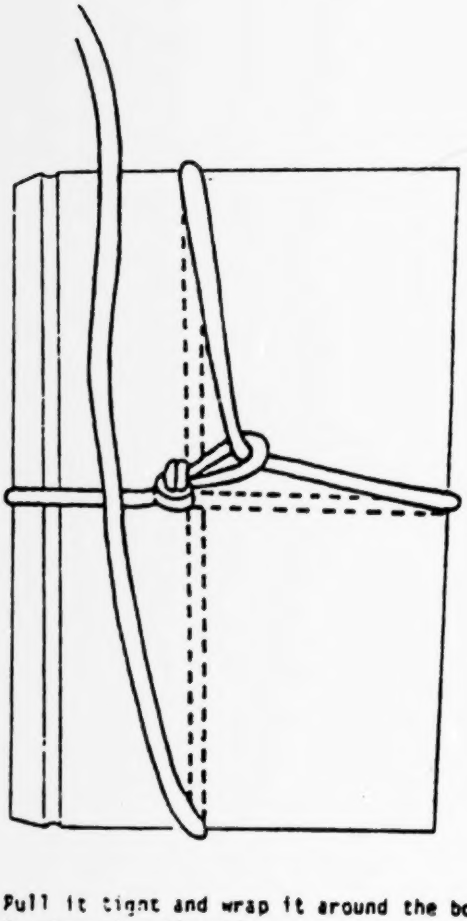




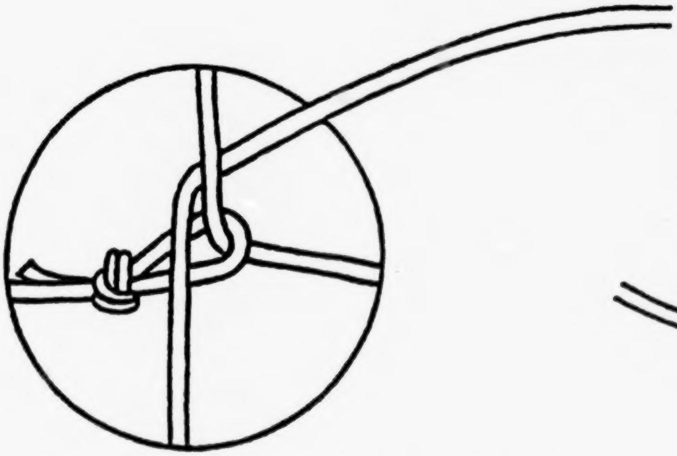
③ Pull it tight, keeping the loop as small as possible.

④ Form a noose and loop it around the book.

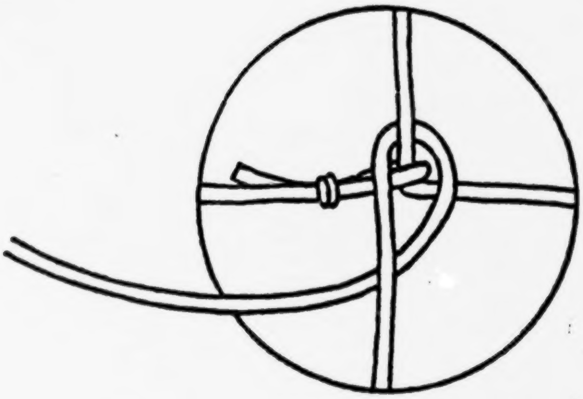




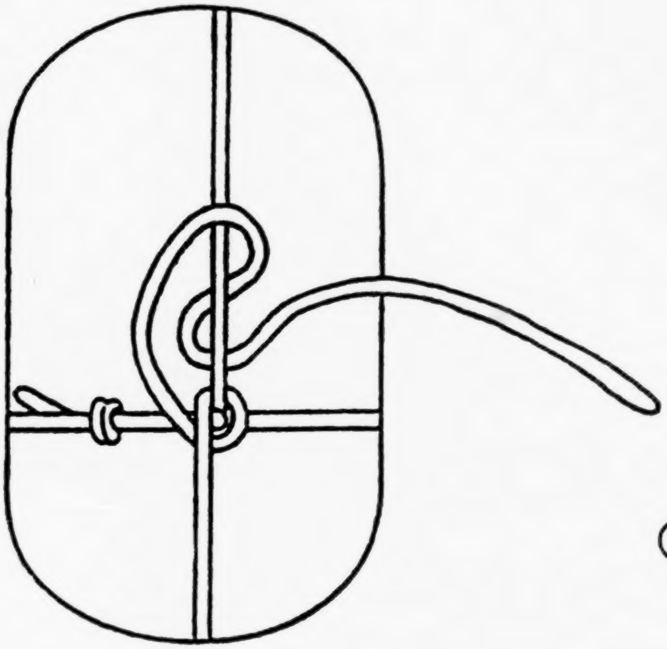
⑤ Pull it tight and wrap it around the book in the other direction.



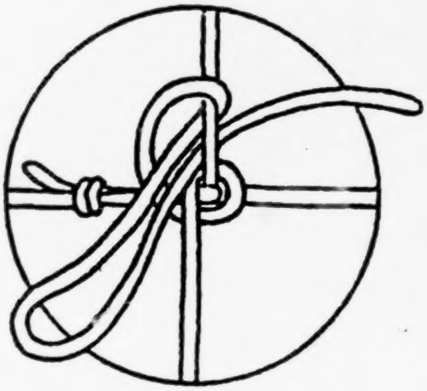
⑥ Keeping the tape as tight as possible, slip the free end under the upper portion as shown.



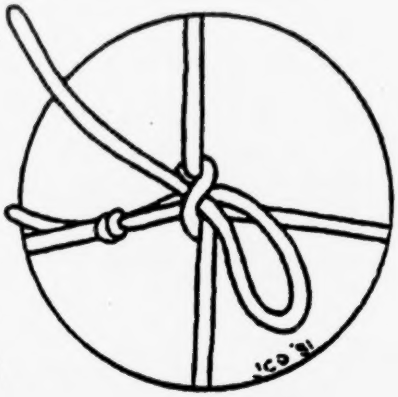
⑦ Carry the tape around and put it under the lower portion. Pull tight.



⑧ Continuing around, bring the free end of the tape over the upper portion and push a loop underneath it.



⑨ Pull that loop through and tighten, leaving the free end above the final knot.



⑩ Pull the loop tight. This will move the loop around to the right as shown in the diagram. To release the knot simply pull on the free end of the tape.

Northeast Document Conservation Center, 1981

STORAGE OF LIBRARY MATERIALS

The benefits of expensive air-conditioning systems and the most meticulous attention to housekeeping will be of little avail if the containers, shelving and cabinetry for library materials are not well designed. The importance of scientific design of book stacks for new construction or the renovation of old buildings has been well covered by several experts in the field, including the excellent discussion of the relation between building design and book preservation by Keyes D. Metcalf, Librarian Emeritus, Harvard College Library, in Restaurator (3).

File folders, document boxes, slip cases for books, and portfolios for prints, maps, and broadsides which are made of inferior cardboard, or are lined with cheap ground wood pulp or rosin sized paper, contaminate the material they are "protecting" by the migration of their acid into the paper or leather they contact. Flimsy document boxes with loose, ill-fitting covers are nesting places for vermin. They also admit dust and mold spores which find them ideal places for growth. Wooden boxes are gnawed by rodents, are bored by bookworms, are high in lignin content, and are hygroscopic. Tin and steel boxes rust. Plastic envelopes, if not carefully selected, may seriously damage photographs, negatives, and film slides. Containers for library materials, whatever their size and shape, should be made only of high quality acid-free paper and cardboard, aluminum, stainless steel, cellulose acetate, or acid resistant leather. Covers should be dust tight, but not air tight.

As additional protection, little used materials can be individually sealed in thin bags of Mylar (polyethylene terephthalate) sold for household use. These come in a wide variety of sizes and can be used to contain books, manuscript boxes, framed pictures, etc., or as inner wrappings on boxed books. Priscilla Berridge, a conservation officer at Cambridge University Library, reported to the U. K. Group, International Institute for Conservation in May, 1970, on how that library has utilized polyester film envelopes in several ways as a protective covering for many thousands of Hebrew manuscripts dating from the Second Century A.D. (4).

It is relatively easy to test folders, document boxes, wrappers and portfolios to see if replacement is required. The test kit and procedures developed by the W.J. Barrow Research Laboratory can be used for this purpose(8). With the phloroglucinol, chlorophenyl red, and aluminon solution provided in the test kit, one can readily determine if lignin, or aluminum ions are present or the pH is too low, any one of which disqualifies the material for protective purposes.

Many kraft papers (sulphate process chemical wood pulp paper), often called "Neutral Kraft," have a pH of 7.0 or better. These papers are recommended for utility use in libraries and archives if the users will make a practice of testing each roll of the material delivered, using the Barrow Laboratory spot test kit.

The Institute of Paper Chemistry has completed a study for the Council on Library Resources on the suitability of protective boxes (5). The conclusions were that control of acidity in box material is a simple matter, but that good housekeeping is more effective in keeping insects from boxes than is the incorporation of chemical ingredients in the stock to repel them. Plastic coating and aluminum lamination of the cardboard improve resistance to mold, but built-in fire resistance is difficult to obtain. An alternative for those needing such receptacles is to select a sturdy, high quality box for general storage purposes and slip the documents to be filed into acid-free folders before placing them in the boxes. The specifications for storage boxes developed for the National Archives are given in American Archivist (Vol. 13, 1950 and Vol. 17, 1954).

Book boxes are useful for protecting luxury bindings, old bindings with important decoration and tooling, and rare books in contemporary, but dilapidated boards. Boxes with fall-down covers are much better suited for this purpose than the traditional slip cases and solander cases, because books can easily be removed from them without subjecting the spines to strain or the sides to abrasion.

The most practical and economical method for storing pamphlets is in document boxes made to sizes convenient for shelving. This preserves the slender volumes in their original state. Luxury bindings for valuable pamphlets, regardless of how pleasing to the eye, or bulk bindings of runs of pamphlets are never entirely satisfactory. Bulk bindings, if oversewn, are awkward to handle and difficult to read because of the reduced inner margin. When miscellaneous pamphlets are bound together and the edges trimmed, it is inevitable that one or more will have dangerously cropped margins. Pamphlets required for circulation must be bound. However, they should not be expected to last as long as other books in circulation. Important and valuable pamphlets should be individually boxed.

Collections of manuscripts are best stored in acid-free wrappers in flat boxes with the documents unfolded. The use of acid-free file folders in steel drawer filing cabinets is more convenient but is less satisfactory from the point of view of preservation. Documents standing on edge are more likely to be injured when removed from crowded drawers. The nineteenth century practice of binding manuscripts in book form, has largely been abandoned. Owners of manuscript collections in these bindings, with the manuscripts often pasted to highly acid ground wood pulp paper, will usually find that inferior materials have badly contaminated the records they are "protecting." It is important to remove such damaged records from these bindings as soon as possible and to place them in acid-free wrappers. These should be stored in flat document boxes until such time as they can be deacidified, old paste and glue removed, and other necessary repairs made. When stored in boxes, up to ten manuscripts can safely be kept in each wrapper, and ten wrappers will fit into each box, thus providing safe convenient storage in one container for fifty to one hundred documents. For individual protection of extremely valuable material, the procedures used at Cambridge University Library (4) for packaging them individually in polyester envelopes should be considered.

Assuming that librarians are able to store all their manuscripts in acid-free wrappers in sturdy boxes, there is still danger to their collections:

(a) if ground wood pulp paper or rosin sized paper is in the same folder with good quality paper,

(b) if news clippings are attached to written or typewritten records,

(c) if cardboard separators are used for convenience.

News clippings should be deacidified if they must be filed with good paper, otherwise they should be filed separately. Records that have become dark and brittle with age should be removed and tested for acid and lignin, and restorative measures taken before they are returned to the files. When highly acid documents are discovered, it would be well to test other papers with which they may have been in contact for extended periods.

The disparity in the physical conditions of prints of any period is due as much to improper storage as it is to chemical and physical deterioration (7). The proper care of prints includes careful handling as well as the provision of a safe environment. Prints should be filed in flat boxes or flat drawer metal filing cabinets and should be in individual acid-free paper wrappers. To minimize the probability of damage, handling should be reduced to a minimum. Use two hands when it is necessary to remove them from their wrappers. When matted for exhibition, 100% rag content board with Japanese mulberry paper hinges should be used. Pressure sensitive tape should not be used. A vegetable based paste adhesive such as wheat starch or rice starch or methyl cellulose should be used. Sheets of polyester film, such as Mylar in the windows of open-face mounts will provide extra protection.

Broadsides are best protected in acid-free paper wrappers in flat document boxes or files. When handling is necessary, the same precautions should apply as for prints.

Maps are awkward to handle. They are rarely of uniform size; many are rolled on wooden rods or have been clumsily folded. The rolled maps are usually dirty, embrittled by acid, darkened by varnish, and backed by rotting fabric. The deterioration of rolled maps is usually more pronounced at the end which forms the outside layer of the roll. Folded maps are often as bad.

The best protection for maps is to file them in acid-free wrappers in flat drawer steel blueprint files. Up to ten sheets can be put in one wrapper and ten filled wrappers will conveniently fit in a drawer. Such map cases are used in the Library of Congress and British Museum map rooms. Blueprint files will receive most maps without folding and almost all sheets with no more than one fold. A single fold does little harm to a map. Double or triple folds are particularly damaging where the creased edges meet and should be avoided. Extra-large sheets can be wrapped around three-inch diameter mailing tubes which have been covered with a good grade of acid-free paper. The bundle can then be wrapped in linen for dust protection and stored on top of the cabinets. Some early maps, particularly those of seacoast areas, were made by irregularly pasting together several smaller printed sheets. When too large for the cabinets, they can be soaked apart, dried and pressed, and filed in a single wrapper with appropriate labeling.

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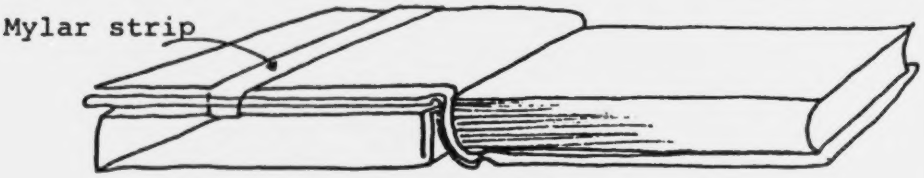
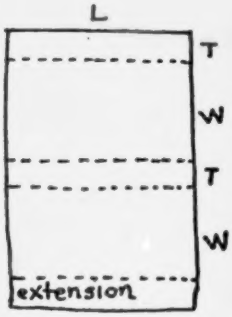
BOOK CRADLES - BOOK DISPLAY AND SAFETY

A. This design is used when the volume can be opened flat and several leaves near the front or back cover are to be exhibited.

1) Measure the Length, Width and Thickness of the book.
2) Mark and fold the .02 or 2-ply folder board parallel to the grain direction of the folder stock, following the diagram.

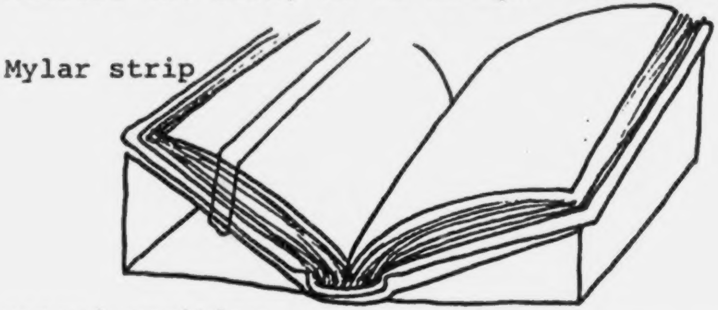


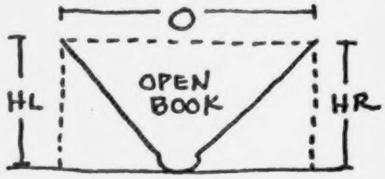


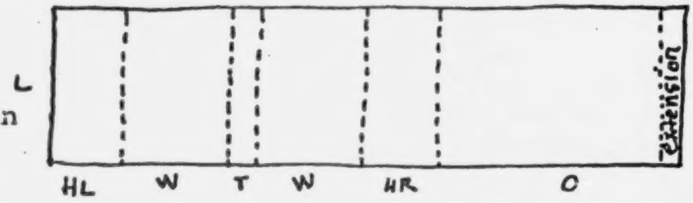
3) Secure the overlapping edge with double-sided tape.
4) The cradle will be an open ended box, through which a mylar strap can be used to hold the pages intact during display.

B. This design is used when the book must be supported in a partially open position on a flat shelf.

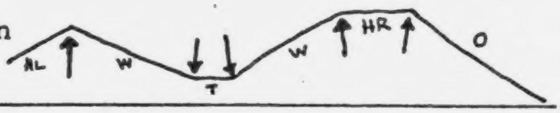
1) Measure the book, as in Design "A", but support volume in opened position to obtain "O", "HL", and "HR" measurements.





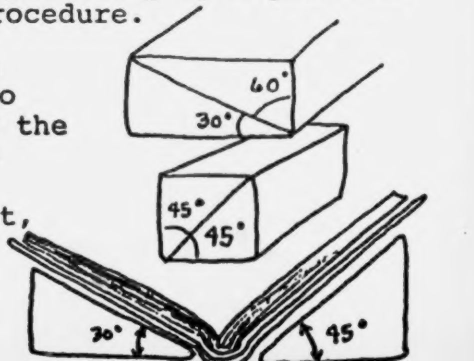


2) Mark and fold the folder stock parallel to the grain direction.
3) Secure the extension with double-sided tape.
4) When making the folds, take care to bend the folder board the proper direction, based on the diagram.



C. This technique will support a volume in a partially open position on a flat shelf, and is a fast and easy procedure.

1) Select a block of rectangular styrofoam and cut it on the diagonal, creating two wedge-shaped pieces. The dimensions of the original block will determine the final angles. (see diagram)
2) Cover the wedges with soft cloth or felt, secured with pins or tacks. If wooden blocks are used, the cover material may be secured with staples.



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Exhibits

Most materials placed on exhibit undergo some damage, however slight. Several precautions may be taken to minimize that damage, and some of the most general are listed here.

1. Restrict display of materials to no longer than three months to avoid fading or permanent distortion/damage. Exhibit conditions for an item that must be displayed for a longer period must be stringently controlled. Watercolors and some other colored items are particularly sensitive to damage by light and should not be displayed or, if they must be exhibited, should not be subjected to lighting levels of greater than five footcandles, or 50 lux.

2. If fluorescent lights must be used in exhibit cases and display areas, filter them to stop ultraviolet (UV) radiation. Filters can be special plastic sleeves or sheets or specially painted light tubes. Curtain or filter all windows providing direct sunlight.

3. Levels of lighting should be carefully controlled to limit damage by fading. A level of five footcandles (50 lux) is recommended by conservation experts, and ten footcandles (100 lux) should be the maximum level. Lighting outside the cases may need to be dimmed for the materials to be viewed adequately.

4. UV radiation and temperature/humidity monitoring devices, and blue wool cloth test cards to detect fading, are available to monitor conditions inside cases.

5. Stabilize the environment within an enclosed exhibit case at 50 percent relative humidity and not above 70 degrees F in temperature. Even in cases without temperature control, the relative humidity can be controlled with preconditioned silica gel (see the second Stolow reference for description).

6. Support opened books properly so that minimal strain is placed on the hinges. For example, a book lying flat opened to the title page can have the front cover supported so that it does not fall back behind the level of the text block. The text block of a book standing up can be supported at the bottom under the square of the covers so that the text block does not pull away from the hinges.

7. Use polyester or polypropylene filmstrips to hold volumes open instead of rubber bands or other acidic materials. Weights (glass or plastic or those made of soft materials, such as "snakes" or bean bags) should be used with extreme care when holding pages open to avoid strain on the paper, binding, and hinges.

8. The original item on display should remain unchanged; all mounting techniques should be reversible.

9. Only clean hands or lint-free gloves should touch materials while preparing them for display.

10. Maintain sufficient insurance to cover theft or damage to display items.

11. Take security measures commensurate with the value of the materials on display. These may include electronically alarmed cases, motion sensors, and/or security guards.

12. Traveling exhibits must be properly packed, insured, and handled. Inspect materials carefully after unpacking and before repacking to determine any damage or loss.

Resources

British Standards Institution. Recommendations for the Storage and Exhibition of Archival Documents. London: BSI, 1977.

Excellent source for standards on building sites, structure and materials, initial equipment, fire prevention, security, and climatic conditions for archival repositories.

Casterline, Gail F. Archives and Manuscripts: Exhibits. Society of American Archivists Basic Manual Series. Chicago: SAA, 1980.

This excellent manual covers a wide range of exhibit considerations including the aesthetic, the layout, and the impact of the exhibit as well as physical precautions and handling procedures. Emphasizes the display of manuscripts and documents.

Clapp, Anne F. Curatorial Care of Works of Art on Paper. 4th rev. ed. Oberlin: Intermuseum Conservation Association, 1980.

Good technical reference, particularly on environmental conditions as they affect items on display.

DuBose, Beverly M. Jr. "Insuring Against Loss." American Association for State and Local History Technical Leaflet 50. History News 24 (May 1969): 103-106.

A very brief survey of the various insurance needs of an institution, including liability as well as loss.

Feller, Robert L. "Control of Deteriorating Effects of Light Upon Museum Objects." Museum 17 (1964): 72-98.

A very good scientific description of the effects of light on books as well as on museum objects.

Garlick, Karen. "Book Cradle Designs." The Deckled Edge 4 (Spring 1984): 4-5.

Describes three types of cradles used at the Folger Library. Includes sketches and diagrams.

Keck, Caroline K. *Safeguarding Your Collection in Travel*. Nashville, TN: American Association for State and Local History, 1970.

A basic work on moving collections and materials for exhibits.

O'Connor, Joan L. "Conservation of Documents in an Exhibit." *American Archivist* 47 (Spring 1984): 156-63.

Discusses conservation work in preparation for an exhibit and the importance of temperature, humidity, air quality and lighting controls in the display environment.

Shapiro, Harry L. "Borrowing and Lending." *Curator* 3 (1960): 197-203.

Problems inherent in excessive museum lending from the perspective of the American Museum of Natural History.

Smith, Merrily A., and Margaret R. Brown. *Matting and Hinging of Works of Art on Paper*. Washington, DC: Library of Congress, Preservation Office, 1981.

An excellent how-to-do-it booklet.

Stolow, Nathan. "Exhibition Conservation: Policies and Directions." *Museum* 29:4 (1977): 192-205.

A good article on planning, shipping, and conserving exhibits that details the many considerations involved.

__________. "Fundamental Case Design for Humidity Sensitive Museum Collections." *Museum News*. (Feb. 1966): 45-52.

An aid in designing exhibit cases for library materials.

Thomson, Garry. *The Museum Environment*. London: Butterworth, 1978.

Basic book on the subject.

Witteborg, Lothar P. *Good Show! A Practical Guide for Temporary Exhibitions*. Nashville: AASLH, 1981.

This guide covers advance planning, lighting, security, fabrication, and installation; it was compiled for the Smithsonian Institution Travelling Exhibition Service.

USERS' GUIDE
TO THE
CONSERVATION OF LIBRARY MATERIALS

THE STANFORD UNIVERSITY LIBRARIES
September 1, 1980

Conservation Quick Reference

1. Pressure-sensitive tape (like Scotch brand) should NEVER be used on books of any lasting value. Check with Conservation for alternative. See page 9.

2. Rubber cement or white glues are not acceptable for most jobs in the library. Use methyl cellulose obtainable from Binding and Finishing. See page 9.

3. Food and drink attract insects, especially cockroaches, and are not allowed in libraries except in designated areas. See page 7.

4. High temperatures and humidity cause great deterioration in books and need to be controlled. See page 7.

5. Ultraviolet light from fluorescent light or natural light accelerates deterioration in books. Turn off light or reduce light as much as possible in all areas. See page 7.

6. Mildew is triggered by books becoming too damp. It will destroy books and will spread in a library. Contact Conservation immediately. See pages 4 and 9.

7. Wet books not only will mildew but may stick so badly that they cannot be saved. Contact Conservation immediately. See pages 4 and 9.

8. Insects are attracted by damp, food, dark and poor air circulation. They must be controlled or will do irreparable damage. Contact Conservation immediately if an infestation is suspected. See page 7.

9. Shelving or retrieving books improperly is a source of great damage. Handling books correctly takes no extra time or effort. See pages 3-4.
   Non-book materials also require special care. See pages 6-7.

10. Photocopying often causes extreme stress on books. Great care is necessary. See page 5.

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I. INTRODUCTION

The University Libraries at Stanford are committed to the conservation of library materials to protect and preserve the collections for the current and future use by the faculty and students. Within all libraries there are major conservation problems, such as brittle paper, solutions of which are costly in terms of time, staff, and money. Conservation may be practiced in many ways which are relatively cost free and easy, but of surprising importance to the welfare of the collections. These measures are mainly preventive conservation -- trying to avoid potential problems or situations which would contribute to the degradation of materials. An example is the effort to control excessive heat, humidity, and light which do great harm to paper, discs, and all forms of film. Library staff and readers can be of tremendous assistance in preventive conservation as they handle and use the resources of the libraries daily.

II. BOOK HANDLING

A. Shelving

A source of great stress and damage to books comes when they are being pulled from the shelf or returned to it. A book should never be pulled at the head cap - or top of the spine - to draw it from the shelf. This produces such stress that soon the case or spine cover will be weakened and torn. An acceptable way to remove the book is to grasp both the front and back boards on either side of the spine about halfway down. If the volume is reluctant to move, gently push books on either side slightly back for a better grasp, or loosen the bookend to allow the pressure on tightly shelved books to relax.

When being reshelved, a book must never be forced between two others. Books should be supported so they stand upright, but not so tightly as to cause damage when removed. Bookends can be loosened or removed if pressure is too tight.

Books allowed to slump on shelves will become distorted and loose in their cases. Bookends or shelves with sharp edges can cut or wrinkle pages easily. Care must be used not to jam books hastily on shelves which have sharp edges or supports.

Oversized volumes ideally should stand upright. In some cases because of their size or the impossibility of moving shelves, they may be laid flat if the shelves are wide enough to support them.No more than three or four should be stacked or retrieval of the bottom ones will be difficult. If neither of these alternatives is possible, volumes should be stored spine down to prevent the text block from sagging away from the spine of the case. If call number identification is a problem, the call number may be inserted on an acid-free slip protruding from the top of the book; alternatively, the call number label may be placed on a top corner of the front cover.

B. Booktrucks

To avoid being tipped over, booktrucks must have sturdy shelves and wheels and must be well maintained. Elastic cords stretched the length of the truck will prevent books from tumbling off. All but the large folio-sized volumes should stand upright on the truck shelves, with no other books stacked on top or behind. Folios should lie flat with care taken to prevent corners or edges banging against narrow doorways or range aisles, and especially going on and off elevators.

C. Support and Handling

For all their remarkable sturdiness, books must be handled with care. A dropped volume can result in broken corners, weakened or broken hinges, or loss of case. Worse yet, a book dropped on wet pavement can absorb enough moisture to mildew when returned to a warm environment. Repair of such damage is time-consuming and costly.

Careless opening of a new book, or a newly rebound book, will crack its spine, permanently damaging the book's structure. Such damage cannot be corrected except by totally rebinding the book.

If approached properly, a new or tight book can be encouraged to open easily. With the book on its spine on a flat surface, and the text block held upright, the front cover should be opened carefully and the fingers run gently up and down the hinge area. The same process is then applied to the back cover. Each flyleaf, front and back, is handled the same way. Then, alternating back and front, small sections of 10-15 pages may be opened while the main text block is firmly held upright and the spine length pressed with the fingers to relax it.

If books are to be placed on display, they must be well-supported by a compatible cradle. Or they may be braced slightly propped up, with another support under the open cover. Mylar strips or cloth snakes help keep pages open and flat. Hinge areas are particularly vulnerable to damage if not bolstered properly.

When books are being stamped, pocketed or plated, the cover should be braced flat against a table and not merely opened. Never lift a book by its cover alone.

Occasionally, books are encountered whose pages have not been cut. These may be cut by a staff member. This task is not particularly difficult but does require care and attention. Hold the book only partially opened, so that the page to be cut lies perfectly flat. Using a long flat kitchen knife, cut the top and foredges with very short strokes. Do not saw back and forth through the folds. Holding the textblock flat with your free hand will help you guide the knife accurately and avoid cutting the pages unevenly.

D. Photocopying

Placing a book face down on a photocopy machine is almost always harmful. Bindings and cases are bent in ways they were not designed to be bent. Very quickly bindings are broken or pages pulled loose. If paper in the volume is brittle it will break at stress points. The problem is made even worse by the familiar practice of pressing books flat for better copy. This practice is not acceptable.

If necessary, photocopying can be done by gently inverting the book, closing the flap, and copying. As an alternative, the library photocopying service can obtain good copy on its special machine.

E. Book Returns

There seems to be no ideal book return apparatus. The concept of "dropping" is obviously harmful, with books falling on hinges, corners, each other, open pages, etc. Care must be taken when removing books from drop boxes to lift them by closing the covers and grasping the whole book. Bent pages should be carefully straightened. Users can help by returning books directly to the Circulation Desk.

F. Circulation Staff

A Circulation Staff alert to the problems inherent in handling books can do much to help. Demonstrating proper handling techniques at the Circulation desk can educate patrons to the need for concern. Reshelving returned books before they pile up on a table or in a box can eliminate much damage. Shelving books properly in reserve areas educates the public to acceptable techniques. Carrying a modest rather than larger number of books will help to avoid dropping them. Watching for brittleness and major need for repairs and routing these materials for attention, helps maintain the collections. Maintaining and demonstrating concern for the welfare of library materials in the midst of a full daily schedule is difficult but important.

III. NON-BOOK HANDLING AND MAINTENANCE

A. Storage and Handling

Non-book library materials such as film, microfiche, photographs, tapes, slides, computer tapes and phonograph discs are particularly vulnerable to instant and permanent damage. They must be stored in as benign an environment as possible, preferably 65° F and 40% R.H. Strong light is particularly harmful to all film products. In addition, containers, envelopes, albums, and cabinets or shelves should be acid-free and inert. Old nitrate film is highly combustible and should be replaced immediately by acetate "safety" film and in the meantime be kept chilled and isolated. Safety film is marked as such along the edge. If in doubt, a good processing lab can check the film. All these materials are particularly susceptible to dust, so care must be taken to keep the environment dust free. This includes the equipment to be used with the materials. Insects enjoy film as much as paper, if dirty fingers have touched it. Fingers should be kept off film or disc surfaces. Rubber bands should never be used.

Phonograph discs must be stored in both their inner and outer jackets. Because discs are especially vulnerable to scratches, great care should be exercised. Discs should be shelved upright and firmly supported; stacking them horizontally will cause warping. Care must be taken not to carry too many at one to avoid cracking or dropping.

Recording tape should not be stored in the machine. Computer tapes and recording tapes will be erased if they are stored where heavy electric equipment will affect their magnetic fields.

B. Copying and Production

Film copying or production is done only by approved and reputable firms following published standards. Interlibrary Services can arrange for copying if needed. Copyright laws are strictly followed.

IV. BOOK MAINTENANCE

A. Environment

Paper is extremely vulnerable to heat which speeds up the chemical process of deterioration. For every 10° rise in temperature over 70°, paper life decreases by half. It is for this reason that libraries and museums have been exempted from 1979 federal regulations governing temperature in public places. Fluctuations in temperature are also harmful, causing cellulose to swell and shrink, weakening its structure. Consequently, the library temperature should be maintained at a temperature of 68° F ± 2°, which will provide a suitable environment for library materials without causing excessive discomfort to library patrons. Wear a sweater; save a book.

Turn off lights. As well as temperature, light (especially ultraviolet light) contributes dramatically to the deterioration of library materials. Fluorescent light, which has a large ultraviolet component, should be turned off when you are finished using a range of shelves.

Food in libraries attracts insects and rodents, who, when they've finished with the food move in to devour paper and bindings. The problem of damage by pests can be kept to a minimum if patrons and staff will strictly obey the prohibition against food and drink in the library, except in the limited authorized areas.

It might seem so slight and unobtrusive a thing as dust could pose no more serious threat to library collections than annoyance on the part of users, but such is not the case. In the modern, polluted world, dust functions as host to a variety of contaminants that will do damage to paper, leather, and cloth. Library staff can minimize the effect of these contaminants by dusting books and shelves in a regular program of maintenance. Books will benefit tremendously from a light dusting on the top edge (as well as any other dusty parts) using a feather duster sprayed with Endust. Books should never be "scrubbed at" with a dust cloth as the abrasive action of the cloth and the dust cause much damange to paper and cloth. (Never spray the book or shelves directly.) Shelves should also be dusted, with a cloth or duster sprayed with Endust, which helps control excessive air-born dust in the stacks. Or a small portable vacuum may be used.

B. Treatment of Books by Readers

While most people will agree that willful mutilation of library materials - cutting out plates, disfiguring, etc. - is contemptible, there are "little mutilations" that, though they may seem inconsequential, may be every bit as harmful as any acts of vandalism. Any object placed in a book, a pencil used as a bookmark for example, can cause damage to the binding. Even a paper clip can cause significant damage. In time, a paper clip will rust and create a weak spot in the paper, and paper will tear along the edge of a paper clip. The removal of a paper clip, too, often results in torn pages. Even a plastic paper clip forces pages out of shape, causing a distortion that is permanent. Folding pages, "dog earing", is a bad practice, and not at all an acceptable means of marking one's place in a book. When paper is creased, there is a stress place upon the fibers and eventually, as the paper ages, weakens along the fold. There is really no substitute for an old-fashioned paper bookmark, and acid-free bookmarks are available in the library.

If, for some reason, it is necessary to tie up a book, only acid-free ribbon (which can be supplied by the Conservation Office) should be used. Under no circumstances should a book be held by a rubber band, since this will damage the edge of the boards and may even cut into the text block.

Underlining and "highlighting" leave marks that are often irreversible, always disconcerting, and occasionally disastrous, since inks may bleed and obliterate text. No library volume should ever be marked by a reader. In general, pens present a danger to books and it is advisable to use pencils for notetaking whenever possible.

C Repair

Book repair is a craft, one that requires knowledge, experience, and skill. All repairs should be left for the Binding and Finishing Division or the Conservation Office. Ill-advised and improper repairs, especially those "first aid" treatments that are performed with the best of motives but without understanding of the structure of a book, usually do more harm than good. Sadly, it is not at all uncommon to find a book that, though originally needing only minor treatment, has suffered irreparable damage as a result of improper "repair".

One of the most common problems encountered in makeshift repair is the use, or misuse, of pressure sensitive tape. This material, while a wonderful aid for many household and office tasks, has no place in books. Some pressure sensitive tapes have adhesives that turn brown with age and drastically weaken the paper; others have adhesives that bleed when they are subjected to heat and cause pages to stick together. All are thick and inflexible, and act as a cutting edge against which paper tears. In addition, these tapes are extremely difficult, even impossible, to remove and will prevent or interfere with any subsequent repair. If a reader should come upon a book needing repair, the kindest service he/she could perform would be to bring the condition to the attention of library staff, who will see that the book receives appropriate treatment. Similarly, if a reader discovers that a book is wet, infested with insects, or mildewed, as evidenced by the growth of visible mold or a foul, musty odor, he/she should notify the library staff.

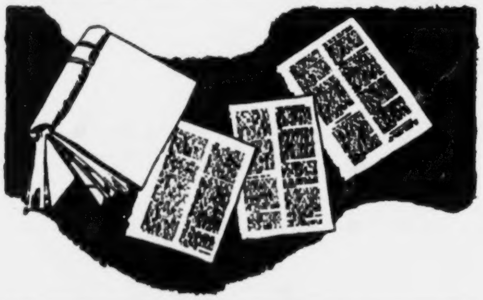
When a staff member needs to use paste in a book, when replacing a book pocket for example, only methyl cellulose adhesive (available from Binding and Finishing) should be used. Both rubber cement, which decays quickly and causes staining, and white glue, which is not reversible, are unacceptable for use in books.

Preventive Conservation is positive action libraries can undertake to prolong the life and usefulness of the material within their collections.

Sally Buchanan
Walter Henry

Poster designs

Reproduced with the permission of the South Dakota State University. Hilton M. Briggs Library.



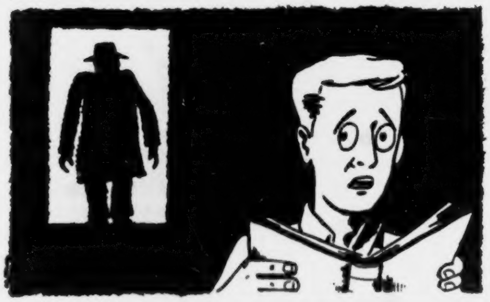
Rrrrrripoff.

Some people think we can replace damaged books and journals immediately.

Well, we can't.

Books and periodicals are often out of print, and even when we can replace them it takes months and the cost is high—$8.00 to $10.00 a page.

PLEASE. RESPECT YOUR LIBRARY. DON'T DAMAGE BOOKS.

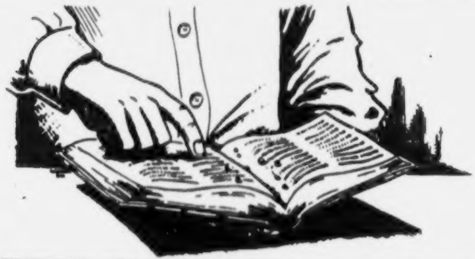


Someone's after you.

Someone will need to use these books and periodicals after you do. Other students and researchers will follow in your footsteps, hoping to have the same materials available to them that you've used.

Don't disappoint them.

PLEASE. RESPECT YOUR LIBRARY. DON'T DAMAGE BOOKS.

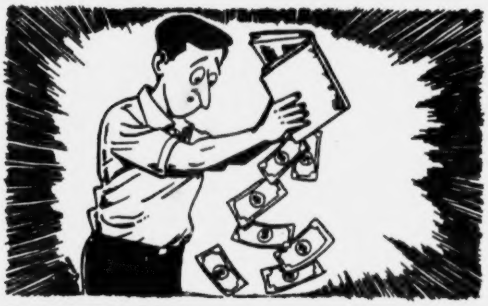


There are nacho chips on page 372.

Someone brought them into the library. He's gone but they're still here. Getting greasespots on the page. Calling bugs.

And what bugs do to books isn't nice. It costs a lot of money to control insects and replace damaged books.

PLEASE. RESPECT YOUR LIBRARY. NO FOOD OR DRINKS.

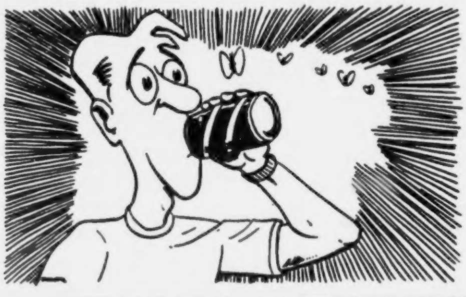


$8.00 to $10.00 a page.

That's what it costs to replace mutilated library materials. When they *can* be replaced. Often books and periodicals are out of print. And if you mutilate library materials, you'll pay a stiff fine.

It's expensive for all of us.

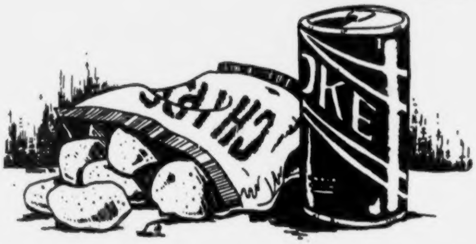
PLEASE. RESPECT YOUR LIBRARY. DON'T DAMAGE BOOKS.



No food. No drink. No bugs.

When you bring your coke or sunflower seeds to the library you invite insects along with you. The remnants of your snacks attract insects—and insects destroy valuable books and journals.

PLEASE. RESPECT YOUR LIBRARY. NO FOOD OR DRINKS.



An engraved invitation.

When you bring snacks along to the library, you are sending insects an engraved invitation. That little bit of coke left in the can and those crumbs on the carpet bring in bugs. Insect control and replacing books damaged by insects costs lots of money.

Please don't invite trouble.

PLEASE. RESPECT YOUR LIBRARY. NO FOOD OR DRINKS.

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Security of Collections

The integrity of a research collection is in part maintained through preservation efforts to slow the physical deterioration of book components. Another major action that can be undertaken to maintain the collection's integrity is in the area of security, a field that is often interrelated with preservation. Security measures can extend from staff review at the circulation desk to door guards, alarm systems, and an overall book security system with books individually alarmed. The following areas and suggestions may be of particular concern to preservation personnel.

1. Labeling sections of binding units may be involved with the application of alarms in books. Whatever system is chosen, the unit applied to the book should be acid-free, be easily installed, not interfere with the opening or other normal use of the book, and be as inconspicuous as possible.

2. Areas using special security measures such as book alarm systems should be clearly marked to warn possible violators of the penalties involved. It may be the library's policy to search all briefcases, bags, and purses at exit doors by guards stationed there. This should also be posted.

3. Deteriorated items should not be allowed to circulate. They should be screened and held by circulation staff for preservation attention so that further damage is not incurred. This special screening also applies to volumes requested through interlibrary loans and for commercial reproduction.

4. Regular daily inspections of all stack and office areas should be made by security personnel so that potential problems can be caught early.

5. To curb theft and vandalism to the collections the entire staff should be informed, trained and alert. Security policies and procedures should be part of a library's preservation program.

Resources

Alsford, Denis B. An Approach to Museum Security. Ottawa: Canadian Museums Association, 1975.

An illustrated account of internal and external security considerations.

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A thorough discussion of various library security systems available as of 1979.

Brand, Marvine, ed. *Security for Libraries: People, Buildings and Collections*. Chicago: ALA, 1984.

A basic text for recognition of and solutions for security problems.

Collection Security in ARL Libraries. Washington: SPEC Center, Association of Research Libraries. No. 100 (January 1984).

Collection security policies of academic libraries.

Fennelly, Lawrence. *Museum, Archive and Library Security*. London: Butterworth Publishers, 1982.

Comprehensive reference work on overall security of collections. Although it focuses on museums, this book will be helpful to libraries as well. Discusses security systems, alarm devices, insurance, fire protection, and display problems; includes a large bibliography.

Gandert, Slade Richard. "Protecting Your Collection: A Handbook, Survey, & Guide for the Security of Rare Books, Manuscripts, Archives, & Works of Art." *Library & Archival Security* 4, Nos. 1 & 2, 1982.

Accounts of losses of materials, extensive bibliographies, and suggested preventative measures.

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A pamphlet produced by the Security Committee of the Rare Books and Manuscripts Section of ACRL which describes a system to prevent thefts and the BAM-BAM (Book Alert-Missing Books and Manuscripts) system devised to recover stolen rare books and manuscripts.

Keck, Caroline, and others. *A Primer on Museum Security*. Cooperstown, NY: New York State Historical Association, 1966.

Includes chapters on physical and environmental security, insurance, the effect of light on museum objects, and general information, much of it applicable to books.

Kinney, John M. "Archival Security and Insecurity." *The American Archivist* 38 (Oct. 1975): 493-97.

Basic guidelines for the deterrence of theft.

Knight, Nancy H., ed. "Theft Detection Systems for Libraries: A Survey." *Library Technology Reports* 12 (Nov. 1976): 575-690.

Results of a survey of six manufacturers of theft detection systems. Useful for the comparisons it makes.

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As its predecessor, *Library Security Newsletter*, this serial covers all aspects of security issues, E.G. theft, fire hazards, willful vandalism and mutilation, etc.

Library of Congress. *Marking Manuscripts*. Preservation Leaflet Series No. 4. Washington, DC: LC, 1976.

Good introduction to the technique and technical aspects of marking.

Library Security Newsletter (V. 1-2, No. 2, Jan. 1975-Summer 1978). New York: Haworth Press.

A pioneer serial for security issues which became *Library & Archival Security*.

Lincoln, Alan Jay. *Crime in the Library: A Study of Patterns, Impact, and Security.* New York: R.R. Bowker, 1984.

Contains the results of a three year study of library crimes with attention given to security and low cost prevention options.

__________. Issue Editor. "Protecting the Library." *Library Trends* 33 (Summer 1984).

Important collection of articles covering all facets of security issues. Of special interest is the article dealing with statutory protection as codified by law for all states.

Nelson, Norman L. "Reducing Theft, Mutilation and Defacement of Library Materials." *CAN: Conservation Administration News*. No. 17 (April 1984).

A concise overview of library security problems.

Sable, Martin H. "The Protection of the Library and Archive: An International Bibliography." Special issue of *Library and Archival Security* 5 (Summer/Fall 1983).

Covers the literature on electronic detection and security systems, insurance legal aspects, mutilation, theft, loss, vandalism and warfare.

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Theft detection system planning and use in academic libraries.

Walch, Timothy. *Archives and Manuscripts: Security*. Chicago: Society of American Archivists, 1977.

Section 4: Surveying Collection Conditions

DETERIORATION SURVEY OF THE STANFORD UNIVERSITY LIBRARIES GREEN LIBRARY STACK COLLECTION

Sarah Buchanan
Sandra Coleman
June 1979

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Figure 2. Score (Weighted Average) by Classification 16

Background of the Project

There is no doubt that the deterioration of book collections is of mounting concern. Pamela Darling of Columbia University Libraries has written an article about the problem for Library Journal entitled "Call to Action" which was based on a paper presented to a "Books in Peril" conference at Columbia in 1976.[1] Paul Banks of the Newberry Research Library in Chicago and Daniel Boorstin of the Library of Congress have also campaigned vigorously for attention to be paid to this mounting problem. The Library of Congress in a report entitled "A National Preservation Program for Libraries" states that "Library materials published since about 1800, present the biggest preservation problem with which American libraries must contend. These are the materials which, for the most part, are not rare enough or intrinsically valuable enough to justify restoration in the original format, but are of sufficient value to justify preservation of the intellectual content."[2] L.C. goes on to say that 30% of their own collection is embrittled to the point of significant damage. L.C. also states that Columbia has 30% embrittlement of their total collection; New York Public Library has more than half of their research collection embrittled; Harvard, 40%. These are alarming figures which indicate an immediate need for action.

Yet all of these figures are only estimates. When Columbia, Harvard and the New York Public Library were asked for information about how they obtained their figures, they all responded that the numbers were hypothetical or the source unknown to them. A survey of the collection of these libraries to determine the extent of deterioration has never been done. All three libraries report their concern, but they have no reliable figures. Nine other research libraries contacted reported no studies done with the exception of the University of Illinois, which is in the preliminary stages of conducting a survey, and Yale which has received a grant to conduct one.

When concerned librarians discuss deteriorating books, they are referring to the paper as well as to bindings, boards and covers. In fact, in 1959 the W.J. Barrows Research Laboratory of Richmond, Va. published a landmark report stating that the major cause of deterioration of modern books was the high acid content of the paper being used. The combination of acid with environmental factors of heat, humidity and ultra-violet light further deteriorated books. The laboratory estimated a shelf-life of 50 years for books printed in the twentieth century.[3] Frazier Poole of L.C. estimates present day book paper has a shelf-life of 30-35 years.[4] Acid paper is one of the major factors causing book deterioration in library collections. It affects bindings and covers whose contents are paper products too. Acid creeps to other volumes as well which may not originally have been as highly acid.[5]

If the problem is as severe as L.C. and others indicate, then action does need to be taken before all our books crumble to dust on the shelves. As this is a concern of libraries of all sizes, many with restricted budgets, a real need for a feasible, reliable and cost-efficient survey to determine level of deterioration is apparent. With an objective, quantitative study a library can then plan what steps need to be taken to help conserve and preserve their collections. Gay Walker of Yale states, "Few libraries have fully documented their preservation efforts. The maintenance of careful statistical records is essential for preservation activities and should be a basic requirement."[6] She also says in the same article, "One of the first steps should be a survey of stack conditions to determine the scope of the problem. It will also aid in providing hard facts for budgeting considerations."[7]

The Stanford University Libraries decided to conduct a survey to determine the deterioration level of the Green Library stacks which house the bulk of its humanities collection. The same stacks also house Government Documents, Special Collections and Archives, none of which would be included in the sample. The collection is housed on seven levels in one building containing over one million items.

One objective of this survey was to develop a good method to determine deterioration in any given collection. By applying consistent methodology, the results would be useful not only to individual libraries, but also as an indication on a national scale of the state of our library collections. As a result, programs of conservation could more readily be planned and carried out.

In some libraries the problem may be minimal enough for the library to live with. In that case these libraries ought to know that expensive programs and new conservation departments are not immediately necessary. Paul Banks suggests in an article "Cooperative Approaches to Conservation"[8] that cooperative programs are the only way libraries can afford to proceed to save their books. Hopefully, the results of a credible survey could encourage such cooperation by providing solid evidence of need.

We were interested not only in determining percentage of deterioration of the collection, but also in demonstrating that such a survey could be conducted with economy of time and money. Because of these self-imposed restrictions, the scope of the survey must be understood. It does not attempt to identify particular books needing attention, nor attempt to determine what caused deterioration, but does determine the present percentage of deterioration of the total book collection using quantitative measurements.

Nature and Methodology of the Survey

The hypothesis for the Stanford survey can be stated as follows: If a reliable random sample can be taken in a research collection, and books selected can be graded in an objective and accurate manner, the percentage of deterioration can be determined.

Ideally, the results of this survey should be checked against the results of another survey. However, because similar surveys have not been conducted, only the guidelines and grading system can be tested. Then the survey can proceed with assurance that the results will have statistical significance. The criterion measures are twofold. If the precision of the random sample can be counted upon, the first half of the survey will be reliable. And if the reliability of the guidelines and grading system can be tested, then we have reason to believe the second half will contribute valid statistics.

Before employing random numbers to survey a collection, the sample size must be determined. For the purpose of this survey, the sample size was based on the formula taken from M. Carl Drott's article "Random Sampling: A Tool for Library Reserach."[9] On page 124, Drott presents a table to determine sample size considering confidence level and tolerance. He also states that the table is "valid only for sample sizes over 30 but less than 10% of the total population."[10] Since many research collections have populations over one million, the restriction is no problem. He suggests that the sample can be corrected if necessary by estimating what percentage of the sample will be in the category for which you are testing. The estimated percentage is written as a decimal and subtracted from 1.00. The two fractions are multiplied by the sample size from Table 1, giving a corrected sample size. Because there are many different percentage estimates of deterioration, the sample in this survey will utilize the most conservative size estimate directly from the table. A 95% confidence level with a 5% tolerance interval will be used for this study. However, the confidence level and tolerance interval could easily be changed depending upon the time and money available and the accuracy desired. The sample size required for a 95% confidence level and a 5% tolerance interval is 384 books.

The validity of the sampling technique depends upon the random sample. Drott suggests that the best way to assure true randomness is by using tables of random numbers. The sample can be selected using the shelf list or it can be determined by randomly selecting section, shelf and book. For the Stanford survey the second method was used. If this method is not feasible in other libraries, Drott's directions for sampling using the shelf list can be employed.

Some consideration must be given to whether books checked out by students, and which presumably would not be deteriorated, would affect the accuracy of the sample. This consideration might be balanced by the number of books removed for rebinding and repair. At any rate, the numbers may very well be small enough not to affect the outcome. If it is thought that this problem should be accounted for, a formula to correct bias can be applied.

Instead of following Drott's suggestions for converting tables of random numbers Stanford Libraries called upon the expertise of Andrew C. Buchanan and Dr. Bruce G. Buchanan to write a computer program which would generate random numbers to select level, range, section, shelf and book. The program automatically eliminated ranges which did not exist on various levels, parts of levels devoted to collections not sampled, e.g. Government Documents, and sections removed for study carrels. This aspect helped save time by reducing "rejects". This program is on file at Stanford University Libraries and may be examined upon request. The program set up the worksheets which were used by the survey team. The worksheets were printed by computer. If this service is not available for use by a library, Drott's rules for converting random numbers can certainly be employed.

The worksheet designed for the Stanford survey listed one random number for level, for range, for section, for shelf, but six numbers for books since the possible number of books on any shelf ranged from 0-49. Because of the number of possibilities, a choice of numbers was necessary to cover "rejects". E.g., a shelf could have only three books, but the first random number might be ten. That number was crossed off and the survey team member proceeded until one number could be used. There were also "rejects" in the range, section and shelf numbers due to missing shelves, empty sections or ranges removed but not recorded on the library stack map. Survey members simply crossed out those entries, marked why they were rejected and dropped down to the next selection. The worksheet provided space across one line for the random numbers, book call number, short title, date of publication, place of publication and the grading system used. A sample worksheet is attached as Appendix A.

Once the sample size is determined and the method for employing random numbers decided upon, the criteria for judging the books and the grading system can be examined.

Criteria and Grading

For this study a book is defined as deteriorated if it is in such poor condition that it should not be used without immediate repair, or if it is not expected to last for any length of time on the shelf. The level of deterioration will be examined for three main categories which will be graded on a scale within each category. This is for the purpose of defining the deterioration of each book as well as providing a way of grading and counting the percentage of deterioration in the entire collection. The survey will not take into account environmental factors, as we are not concerned with the causes of deterioration, only the effects. Consequently, how long a book has been in the library or what its earlier treatment has been does not concern us, only its present physical state. A survey could, however, note insect, mildew or other environmental problems if a library so desired. (Appendix B) These factors, however, would not be counted as part of the measure of deterioration. The condition of paper, bindings and boards and covers will demonstrate deterioration effects for measurement without the need to determine how the deterioration happened.

The three categories in this study of deterioration are:

A. Paper condition

B. Binding condition

C. Board and cover condition

Each category is assigned three grades of condition and also assigned a number reflecting that grade:

0, good condition; needs no attention

1, moderate condition; evidence of deterioration, needs some attention

2, poor condition; rapid deterioration, needs immediate attention, should not be used.

The numbers assigned to the categories above are simply arbitrary and kept low for ease of manipulation.

The categories are weighted for this survey because deterioration of paper is considered more serious than binding or board problems. The latter two problems can often be repaired in house, but paper deterioration takes much more time, skill and money. If the paper goes, the book is gone. But bindings and boards can be replaced without destroying the intellectual content. Again, the weighting is arbitrary, but is responding to what the literature considers the more "serious" problem. Therefore, binding or boards and covers alone count only one half as much as paper does when assigning a grade.

The criteria for judging books were written to be understood by anyone the library might employ to help with the survey. They must be objective measures of condition and they must be clear enough to be understood with a minimum of training.

The guidelines for determining the grades of conditions are as follows:

A. Paper condition

0. Paper not cracked or crumbling; edges not worn or roughened; no yellowing of paper; no pieces shower down when book shaken upside down; no tearing or breaking when corner of page pulled gently.

1. Paper may show tears or small missing pieces; edges may look slightly worn; slight yellowing of paper may occur - especially edges; no pieces shower down when book gently shaken upside down; no tearing or breaking when corner of page pulled gently. When fold test of 6 folds employed, no breaking or tearing when corners pulled gently.

2. Paper cracked, torn, missing pieces, crumbling; edges worn or badly roughened; maybe yellowing of paper; pieces of paper may shower down when book shaken gently upside down; tearing or breaking or cracking of pages when corners pulled gently. When fold test of 6 folds employed at corner; breaking or tearing occurs when corner tugged gently.

B. Binding condition

Stitching means the thread used in large stitches to hold the sections or signatures or the book together and sometimes to fasten the body of the book to the boards. Glue is used in many books to fasten pages together and to fasten the body of the book to the boards.

0. Stitching, if used, intact; glue, if used, in good shape - not dried or cracked; pages fastened in tightly if tugged gently, no loose pages.

1. Stitching, if used may be loose, but not broken; glue, if used, is in good shape - not dried or cracked; pages may seem loosened if tugged gently, but no more than 2 or 3 pages loose.

2. Stitching, if used, broken or needs repair; glue, if used, dried, cracked; pages not tight, may fall out of book; several pages loose - more than three.

C. Boards and covers

Boards are the cardboard providing stiff backing to a book. Covers are the fabric, paper or leather "covering" the boards on the outside of the book.

0. Boards fastened to book, no breaks at hinges either outside or inside; corners of book not broken, bent or missing; spine of book not torn, no pieces missing; spine cover fastened tightly; cover not torn or badly worn, no repair work done.

1. Boards fastened to book, but there may be a crack at the hinge either inside or outside; corners of boards may be bent or worn but are not missing or badly broken; spine may have minor tear (perhaps at head or tail) but not ripped off or missing; cover still intact but may need minor repair or may be showing signs of wear, may have been repaired.

2. Boards not fastened to body of book, or so badly broken at hinges that they need immediate attention; corners broken, missing or worn away; spine has major damage - torn clear away from body, missing major portions; cover badly torn, worn or missing large portions.

An easy way to grade an individual book is to look at the three grades given to each book and assign one final score based on the directions below.

Apply this first:

A book is a "2" or "deteriorated" if:
    A is 2
    A, B and C are 2
    A and C are 2
    A and B are 2
    B and C are 2

A book is NOT deteriorated if:

    Only B is 2
    Only C is 2
    Nothing is 2

Apply this second:

A book is a "1" or "moderate" if:
    A and B are 1
    A and C are 1
    A, B and C are 1
    A is 1, but B and C are 0
    B and C are 1, but A is 0
    B is 2, but A and C are 0
    C is 2, but A and B are 0

Apply this last:

A book is a "0" or "fine" if:
A, B and C are 0
A and C are 0, B is 1
A and B are 0, C is 1

It is important to note that if paper is assigned a grade of 2, then the final score must be a 2, no matter what the other grades are.

If the paper grade is 1, then the final score cannot be a 0, even if the other two grades are 0.

Also, if either the bindings or boards and covers as defined by the guidelines have received extensive repairs, the book cannot receive 0 as a final grade, but could certainly be graded as a 1.

The percentage of deterioration can be determined easily once grades have been established for all books in the survey. A table for easy understanding might look like this:

	Fine-0	Moderate-1	Deteriorated-2	Total
Books	100	188	96	384

96/384 = 25% deteriorated
188/384 = 49% moderate
100/384 = 26% fine

Obviously further breakdowns can provide a library with information not only about paper, but also bindings and boards and covers. Information could be available about date of publication, place of publication and which level of the stacks houses the most deteriorated items.

We strongly recommend that the guidelines developed for this survey be used by other libraries to provide consistent data for comparison.

Workshop and Pretest

In order to test the sampling techniques developed, the categories set up for the books, and the book rating system, directions for a pre-test are included. This pre-test is an absolutely essential part of the survey and should follow a training workshop.

All the survey team members who will participate in the survey must attend a training workshop as well as the extra personnel who will help with the pre-test. Stanford Libraries employed ten people to do the survey, and asked for five volunteers from the library staff to act as the control group for the pre-test. During the workshop the problem and some history of deterioration should be discussed as well as the purpose of the survey. Each survey participant needs a sample of the guidelines for grading the books, and a sample of the tally sheet. Time should be given to read these thoroughly. Preselected books should be used to demonstrate each point of the guidelines. Slides may be helpful for demonstration too. Good, moderate and poor examples in each category should be displayed and handled. Some group participation in judging would be very helpful at this point. The tally sheet and its use need to be carefully explained. Workers must be advised what to do if a number cannot be used, i.e., an empty shelf or too few books on the shelf. They must understand that a "delete" or "reject" is entered beside the name and number of the book on the tally sheet and use of one of the alternative numbers is substituted.

The system for finding the books should be explained. Each worker should receive a sample sheet of book numbers similar to the ones he will have for the survey and the pre-test. The numbers will be explained and the group taken to the stacks to locate some samples. Time should be taken so everyone feels comfortable about this aspect. Emphasis should be placed on the help available during the actual survey.

Every aspect of the total survey needs to be covered so workers are as familiar as possible with it.

The pre-test should be held the following day. If the results are satisfactory, the survey can begin the day after the pre-test. Not much time should elapse between training and test. A schedule for the workshop and pre-test used at Stanford is given in Appendix C.

A few extra participants should be trained in case someone is ill or needs to drop out of the survey.

In the Stanford Green Library stacks, all ranges are numbered consistently on each level. Hence level and range could be located easily. Directions were given about finding particular sections. The procedure was that each participant faced the numbered ends of the range from the center aisle and counted the first section on his right in a range as section number one. He then counted consecutively down the range, left around the other side and back to the center aisle. The shelves were always counted from the top down; the books from left to right on a shelf. If a wooden book marker was encountered, it was ignored as if it didn't exist. Team members were instructed to grade pamphlets or unbound materials if they turned up as best they could, but to include another bound item in their sample. At the end of the survey, all participants had graded 40 bound items as well as those unbound items they may have encountered. Stanford Green stacks have little unbound material, so this was not as much a problem as it might be for other libraries. Therefore, our statistics are based on bound, covered items only - no pamphlets or unbound items.

In the workshop graders were given a practice set of computer worksheets, divided into three groups, and sent as groups into the stacks to practice finding books. They helped each other grade books, reinforcing what they had learned in the workshop. There was no confusion about using the worksheets or grading the books. We then proceeded to the pre-test.

The purpose of the pre-test was to show that the guidelines, grading system and the method of locating the sample books were well designed and could be used and/or followed by anyone chosen to help with a survey. It also indicated whether or not the grading and guideline systems work. This is accomplished by assuming that if any group can find and grade the books and come within a reasonable score of any other, then the system in fact works. To do this we applied the chi square test as illustrated by Olive Jean Dunn in her book Basic Statistics.[11] The null hypothesis will be that no meaningful difference exists between the scores of different groups who grade the books.

The administrator will select and pull 35 books (35 in order to keep the number over the critical 30 items required for a normal statistical analysis) making sure there are at least five books in each of the three categories. (The five or more is also necessary in order that the chi square test functions.)[12] Because we are not concerned with a random sample at this point, but only with the use of the guidelines and grading systems, the 35 book sample need not be random. In order to make the test as helpful as possible, 5 survey team members and 5 other participants will be asked to grade the books along with the administrator, making three separate groups, A, B and C. All will have attended the workshop. Each grader will grade seven books, the administrator all 35. The tally sheets will be marked carefully to distinguish to which group a grader belongs. The name of the grader will also be included. Following the guidelines, the graders will mark the tally sheets and assign a 0, 1 or 2 to each book.

The administrator now needs to enter the numbers of books for each grade on a table like the one below.

	A	B	C	Totals
0	10	9	11	30
1	20	19	19	58
2	5	7	5	17
	35	35	35	105

The chi square formula is: $X^2 = \frac{(f-F)^2}{F}$

f in our case equals the different numbers for 0, 1 or 2 found by each group.

F is found by dividing total numbers for each category by the total number of scores:

30/105	58/105	17/105
0.286	0.552	0.162

Multiply each decimal by 35 to determine the expected Frequency (F) for each category:

0	1	2
10.01	19.35	5.67

When the formula is applied, chi square is found to be 0.7750. The degrees of freedom for this problem are 4. Now the number can be checked on a chi square table[13] at the 95% level (or any other chosen by the administrator). In this case the calculated chi square is well below the value of chi square at the 95% level in the table. Therefore, we can accept the null hypothesis that there is no meaningful difference between the grading of the three groups. The guidelines and grading system work.

If a large difference is found, the administrator will need to check several possibilities including his own arithmetic. A check back to the tally sheets may reveal the problem. One grader may be way off or the whole group may be grading in a widely different manner. Perhaps only one person needs to be helped to understand the system. But if the whole group is confused, the guidelines may need to be rewritten or made more clear. There may only be difficulty distinguishing between the 1 and 2 books, for instance. But it is very important to straighten out all the problems at this point or the larger survey will be useless. It may be revealing to note whether the administrator's grades and those of the other groups differ greatly. Also graders must be made to feel a part of an important effort so their cooperation can be expected. If there are wide differences and retraining or rewriting is necessary, a new pre-test must be conducted as before.

A pre-test will help provide a great deal of certainty that the guidelines and grading system are consistent and will measure what they have been designed to measure.

Results of the Stanford pre-test are presented in Appendix D.

The Stanford Survey

Once the reliability of the procedure is established, the larger survey can commence. Stanford Library had the team assemble at 8:30 AM to be ready to start at 9:00 AM. Each team member received pencils, clipboard and enough worksheets to find 80 books - twice as many as the actual number of books they were to grade. This was to account for any "rejects" they encountered. Each person worked on his own at his own pace. Because each worksheet had a possibility for eight books, all team members were instructed to organize each individual sheet by levels to prevent a great deal of running up and down between stack levels.

There were occasional questions, so the value of having someone to answer them close at hand was apparent. With an hour for lunch, eight of the ten members had finished 40 books plus an average of 18 "rejects" by 4:00 PM. Two members finished the following morning in less than two hours. The average time to find and grade 40 books including "rejects" was 4 1/2 hours. Thus the workshop, pre-test and survey were completed in three days.

The adminstrators of the survey scored each item by applying the grading instructions. The percentages were established for overall score as well as individual percentages for paper, bindings and boards and covers.

Results of Stanford Survey

Table 1 shows the data obtained in this survey. From these data and the grading criteria discussed previously, it can be concluded (to a 95% level of confidence and a tolerance interval of 5%) that of the random sample of 400 titles chosen from the humanities stack collections:

32.8% are in good condition (weighted average=0)
40.8% are in moderate condition (weighted average=1)
and 26.5% are in poor condition (weighted average=2)

These percentages are displayed graphically in Figure 1.

The striking parallel between the weighted averages and the condition of the paper which can be seen in Table 1 results from two factors. First, the condition of the paper is given twice the weight of the bindings, boards and covers in determining the weighted average. Second, Stanford University Libraries has in the last fifteen years undertaken an intensive rebinding and repair program in the Green Library stacks. This program has impacted favorably on the condition of the bindings, boards and covers, but not on that of the paper. In other libraries the measured level of deterioration may be more strongly influenced by poorer conditions of the bindings, boards and covers than in this survey.

The consistency of application of the grading criteria by the ten survey participants was checked by comparing the individual means of the weighted averages (results for 40 titles) to the overall mean of the weighted averages (results for 400 titles). The individual means all lay within ± two standard deviations of the overall mean, verifying the consistency of grading performance by the survey participants.

Figure 2 is a graph of the weighted averages of the total sample depicting the division between the number of titles classified in the Dewey classification system and the number of titles classified in the Library of Congress system. (These titles sum to 394 since 6 titles in the sample were Stanford theses classed in neither Dewey nor L.C.). These numbers are converted to percentages in Table 2. A significant difference can be seen between the levels of deterioration of titles classified in Dewey and those classified in L.C. This is not unexpected as all titles classified in LC have been added to the Stanford collections since 1966.

These results raise the question of correlation of level of deterioration with date of publication of the book. Table 3 presents an analysis of the scores by decade of publication and by classification. These data are not presented graphically because, with the possible exception of the decades following 1950, the number of titles in any given decade is too small to permit statistically valid conclusions to be drawn. However, a survey of the data in this table reveals the following trends.

1. Prior to 1949 a significant fraction - greater than 1/4 - of the total titles in each decade are deteriorated. This supports the generally accepted statements that the shelf life of books printed in the twentieth century is 35 to 50 years. (It is not until one goes back to the decade 1910-1919 that greater than 1/2 of the titles in a given decade are deteriorated).

Table 1. Level of Deterioration of Total Sample (n=400)

Criterion	Condition of Paper			Condition of Bindings			Condition of Boards & Covers			Weighted Average		
Score	0	1	2	0	1	2	0	1	2	0	1	2
Number of Titles	133	161	106	283	102	15	225	145	30	131	163	106
Percent of Titles	33.3	40.3	26.5	70.8	25.5	3.8	56.3	36.3	7.5	32.8	40.8	26.5

Figure 1. Score (Weighted Average) of Total Survey Sample (n=400)

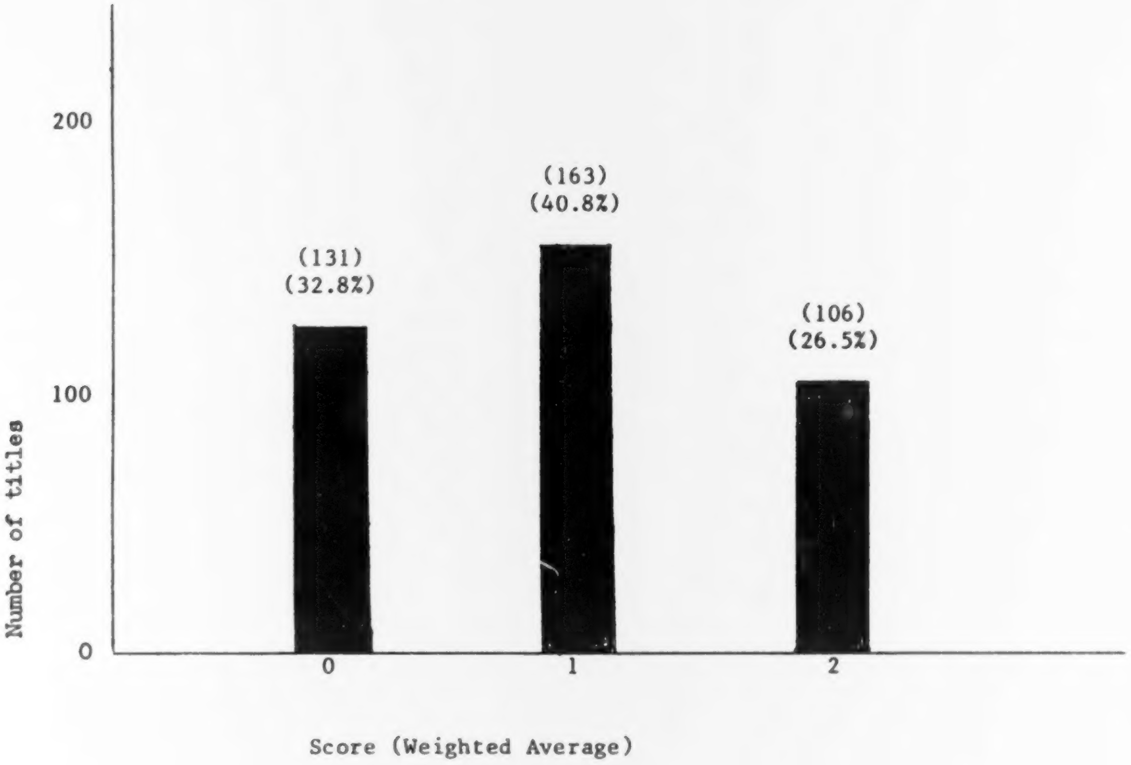

Figure 2. Score (Weighted Average) by Classification

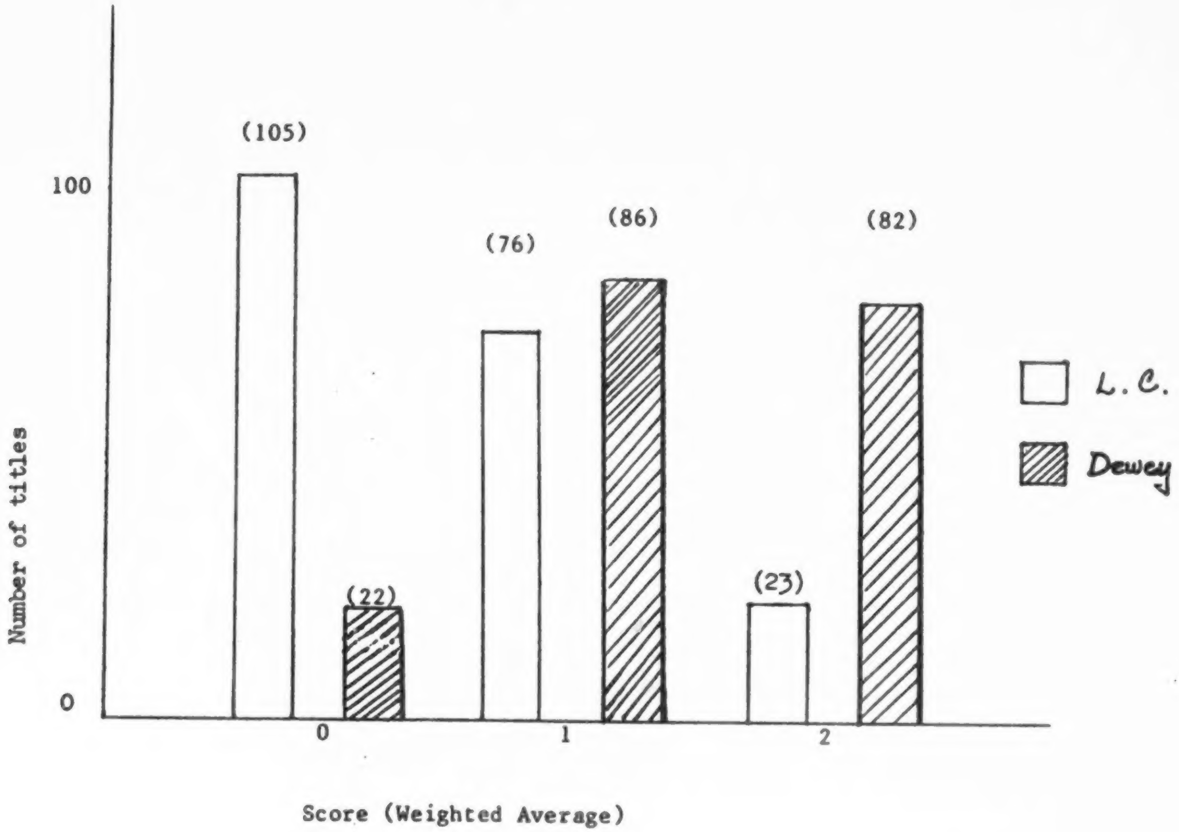

Table 2. Per Cent Deterioration by Classification

	0	1	2
L.C. (n=204)	51.5%	37.3%	11.3%
Dewey (n=190)	11.6%	45.3%	43.2%

2. In general, titles classed in L.C. purchased retrospectively, particularly those published prior to 1920, are in the same level of deterioration as the corresponding Dewey titles which have been housed in the Green Library stacks for longer periods of time.

3. Recent growth in the collection is reflected in the relative number of titles published in recent decades selected in the sample. This further confirms that the sample is representative of the collection.

Table 4 displays the deterioration scores for the sample titles arranged according to the stack level on which the titles were shelved. No attempt will be made to interpret these data as a number of factors, for which no controls were established, may influence the results.

Table 5 displays deterioration level by place of publication. Again, no attempt is made to interpret data for which no controls were established.

Cost of the Survey

The primary cost of the survey in addition to administrative cost, is the staff time needed to conduct the training workshop, pre-test and survey. The time requirements of the survey reported here, together with the training workshop and pre-test, were as follows:

Administrative supervisor Planning, supervising and data compilation	40 hours
Workshop and Pre-test participants 15 participants @ 6 hours	90 hours
Survey participants 10 participants @ 4.5 hours	45 hours
TOTAL	195 hours

Staff costs to the organization will vary with the use of permanent or project staff. The Stanford survey was conducted by members of the flood restoration project team, whose salaries averaged $6.00 per hour plus benefits, supplemented by two students specially hired for the survey at a $35 stipend each, and staff volunteers from two library departments who served as the pre-test control group.

Programming and computer services were donated by a member of the university faculty. Computer time was estimated at $150.00. These costs will also vary from institution to institution. The cost of supplies was minimal and not charged to the survey project.

A test of survey participants and acknowledgments is included in Appendix E.

Table 3 Analysis of Scores by Decade of Publication and Classification

Decade of Publication	Total Titles	Score			LC Titles	LC Score			Dewey Titles	Dewey Score		
		0	1	2		0	1	2		0	1	2
1970-79	87[1]	64	19	4	78	58	17	3	6	4	2	0
1960-69	86[2]	48	34	4	64	39	22	3	20	7	12	1
1950-59	37	8	24	5	6	2	4	0	31	6	20	5
1940-49	29[3]	3	18	8	9	0	7	2	19	3	10	6
1930-39	24	3	11	10	6	2	1	3	18	1	10	7
1920-29	23	2	12	9	9	2	4	3	14	0	8	6
1910-19	15	0	5	10	3	0	2	1	12	0	3	9
1900-09	21	0	8	13	6	0	4	2	15	0	4	11
1890-99	22	1	5	16	5	0	1	4	17	1	4	12
1880-89	9	0	2	7	1	0	1	0	8	0	1	7
1870-79	9	0	2	7	1	0	1	0	8	0	1	7
1860-69	6	0	2	4	2	0	1	1	4	0	1	3
1850-59	1	0	0	1	0	0	0	0	1	0	0	1
1840-49	2	0	2	0	2	0	2	0	0	0	0	0
1830-39	2	1	1	0	2	1	1	0	0	0	0	0
1820-29	3	0	3	0	0	0	0	0	3	0	3	0
1810-19	4	0	3	1	1	0	1	0	3	0	2	1
1800-09	1	1	0	0	1	1	0	0	0	0	0	0
1780-89	1	0	1	0	0	0	0	0	1	0	1	0
1730-39	1	0	1	0	0	0	0	0	1	0	1	0
No Date	17	0	10	7	8	0	7	1	9	0	3	6

[1] This total includes 3 Stanford theses not classed in either LC or Dewey.
[2] This total includes 2 Stanford theses not classed in either LC or Dewey.
[3] This total includes 1 Stanford thesis not classed in either LC or Dewey.

Table 4. Score (Weighted Average) by Stack Level

Stack Level	Classification Assigned to Level	Score (Weighted Average)		
		0	1	2
1	D,DT-DX,E,F, 900-909,950-999	17(33%)	20(38%)	15(29%)
3	DA-DD,DG-DS, 940-949	27(40%)	30(44%)	11(16%)
4	PR-PS, 800-829	21(26%)	31(39%)	28(35%)
5	PB-PN,PT-PZ 830-839	26(43%)	25(42%)	9(15%)
6	PA,PQ 840-899	19(23%)	37(44%)	28(33%)
7	BF,P,3781 130-139,150-159, 400-499	22(39%)	18(32%)	16(29%)

Note:
Government documents shelved on stack level 2 and Special Collections materials shelved on stack level 7 were excluded from the survey sample.

Table 5. Deterioration Level (Weighted Average) by Place of Publication (n=400)

Place of Publication	Total Titles	Deterioration Level (Weighted Average) 0	1	2
England	54	13	26	15
France	35	10	13	12
Germany	40	13	16	11
Italy	16	8	7	1
Spain	13	3	5	5
Slavic Countries	19	7	10	2
Latin America	14	4	7	3
United States	132	49	43	40
N.Y.	68	25	25	18
Boston	8	0	3	5
Chicago	4	1	0	3
California	14	6	4	4
Other U.S.	38	17	11	10
Other	38	17	15	6
Not stated	39	8	19	12

Conclusion

The percentage of deterioration of bound items in Green Library stacks was determined by conducting a survey employing a reliable random sampling technique. This percentage of deterioration was found to be 26.5%. We believe the methodology used to conduct the survey is easily applicable to any other library.

SB:lg

Level	Range	Section	Shelf	Book (one)	Call No.	Short Title	Date	Place	Paper	Bindings	Bnds/Covers	Score
									(circle one in each category)			
1	20	1	4	13 22 15 23 24 24					0 1 2 ,	0 1 2 ,	0 1 2	
6	53	12	6	13 14 24 29 3 13					0 1 2 ,	0 1 2 ,	0 1 2	
3	63	5	5	45 44 29 8 41 15					0 1 2 ,	0 1 2 ,	0 1 2	
4	10	11	7	27 2 9 13 33 42					0 1 2 ,	0 1 2 ,	0 1 2	
7	61	2	4	32 32 13 24 22 37					0 1 2 ,	0 1 2 ,	0 1 2	
6	15	3	1	15 32 44 41 25 39					0 1 2 ,	0 1 2 ,	0 1 2	
1	18	3	6	43 35 5 41 8 1					0 1 2 ,	0 1 2 ,	0 1 2	
7	63	12	1	38 1 43 2 31 44					0 1 2 ,	0 1 2 ,	0 1 2	

Appendix B

The following is an example of guidelines which could be used to note insects or mildew in a collection as a survey was being conducted.

I. Insects and/or Vermin

Insects may be silverfish, beetles, bookworms, earwigs, cockroaches, termites, etc. Vermin are mice or (one hopes not) rats. Signs will be holes in pages or bindings and boards/covers which look like tunnels, either round or oval, chewed corners, dead bodies, droppings or "sawdust"; live creatures may be sighted in severe cases.

0. No signs of holes, chews or bites on pages, spines or covers; no creatures dead or alive if book shaken upside down gently; no droppings on books or shelves.

1. May be a few old holes in cover or text; no signs of recent activity around books; no creatures if book shaken gently.

2. Live insects in books or on shelves; signs of current activity; holes and tunnels or chew marks in boards/covers and areas of text eaten away.

II. Mildew/Mold

Black or green or brown "stain" or growth that looks like spots or fuzzy mold on pages, smells "musty".

0. No signs of stains or spots, no musty smell.

1. Suspicion of mildew - small spots on paper or binding, not widespread, no noticeable musty smell.

2. Heavy mildew, spotting on many pages and/or cover; musty smell.

Appendix C

STANFORD UNIVERSITY LIBRARIES
Book Collection Deterioration Survey
Pre-Survey Training and Pre-Test Workshop
Wednesday, May 23, 1979
Green Library, Room 401

8:45 a.m.	Introductions	
Training		
9:00 a.m.	The Deterioration Survey Project Background, purpose and objectives	Coleman
9:20	Judging Deterioration of a Book Criteria and procedures	Buchanan
10:45	Break	
11:00	The Sampling Process and Procedures Pre-test and survey instructions	Coleman
12:00	Lunch	
Pre-Test		
1:00 p.m.	Sampling the Collection	All participants
2:30	Break	
2:45	Testing the Grading Guidelines	All participants
3:45	Summary	Coleman

Participants will be on their own for lunch and breaks. All materials needed for the workshop will be provided.

Appendix D Pre-test Results

Score		Group		
	A	B	C	Total
0	11	14	17	42
1	14	17	10	42
2	9	4	8	21
	35	35	35	105

Chi Square Test $$x^2=\frac{(f-F)^2}{F}$$

	42/105 .4	42/105 .4	21/105 .4
	0	1	2
F =	14.0	14.0	7.0

Degrees of freedom = 4

Chi square value from table = 9.49

95% confidence level

Chi square value from pre-test = 5.06

Appendix E

Deterioration Survey Staff

Sarah Buchanan, Conservation Officer, Stanford University Libraries.
Survey Project Director

Sandra Coleman, CLR Academic Library Management Intern. Project Assistant

Survey Participants

Diane Blakely
Mary Catherine Carroll
Zoe Chandik
Barbara Davison
Liz Dreisbach
Jean Erickson
Walter Henry
Lutfi Kreitem
Judy Marcoux
Joe Wender

Pre-test Control Group

Walter Baluta, Supervisor Stack Division, Central Circulation Deparment
Jane Leavitt, Library Assistant, Loan Desk, Central Circulation Department
David Molzen, Library Assistant, Meyer Basement, Central Circulation Department
Marie-Francoise Luber, Library Specialist, Collection Development Program
Wojciech Zalewski, Curator, Russian and East European Materials

Acknowledgments

The survey directors would like to thank Dr. Byron Wm. Brown, Professor of Biostatistics, for his critical eye on the design of this survey. And Andrew C. Buchanan and Dr. Bruce G. Buchanan for writing the programs to generate random numbers and to print the worksheets.

FOOTNOTES

[1] Pamela W. Darling, "Call to Action - A Local Preservation Program: Where to Start," Library Journal, November 15, 1977, pp. 2342-51.

[2] "A National Preservation Program for Libraries," Library of Congress Information Bulletin, February 18, 1977, pp. 129-31.

[3] W.J. Barrow, Permanence/Durability of the Book, I-VIII (Richmond, Va.: W.J. Barrow Research Laboratory, 1964).

[4] Frazier Poole, "Thoughts on the Conservation of Library Materials," Library and Archives Conservation, (Boston: Boston Athenaeum, 1972), p. 19.

[5] W.J. Barrow, Permanence/Durability of the Book, I-VIII.

[6] Gay Walker, "Preservation Efforts in Larger U.S. Academic Libraries," College and Research Libraries, January 1975, p. 43.

[7] Gay Walker, p. 41.

[8] Paul Banks, "Cooperative Approaches to Conservation," Library Journal, November 15, 1977, pp. 2348-52.

[9] M. Carl Drott, Random Sampling: A Tool for Library Research," College and Research Libraries, March 1969, p. 124.

[10] M. Carl Drott, p. 120.

[11] Olive Jean Dunn, Basic Statistics, (New York: John Wiley, 1967) pp. 112-125.

[12] Olive Jean Dunn, p. 116.

[13] Olive Jean Dunn, p. 170.

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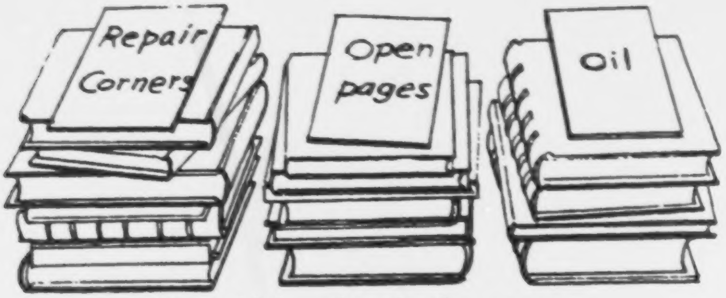
Sorting Books and Identifying Problems

LABELS

Now wheel the truckload of books into the work area. If the books were hand-dusted as they were put into cartons, they can be sorted immediately. If not, they should be hand-dusted as they are removed from the cartons. The well-equipped work area should have several tables. If this is not possible, perhaps empty shelves will be available. Or, as a last resort, the various categories of problems can be sorted into cartons. Have labels on hand made of oblong pieces of heavy cardboard inscribed with a marking pen. Since they are heavy, they are not easily blown away or mislaid. They are to be placed on top, or in front of, stacks or cartons of books to indicate the treatment the books shall receive. Typically, a label reads "OIL," "REPAIR CORNERS," or "OPEN PAGES."



Heavy labels used to identify treatment

BOOK JACKETS

A general decision should be made by the curator or owner about book jackets, before treatment of a collection is begun. Jackets are very often printed on impermanent and weak paper. Evidence of acid migration from the turned-in flaps of the jacket will sometimes be

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observed on the end papers. Jackets tear and soil easily, and yet some bear information not included in the book. One simple solution to the problem is to remove the jackets, write the call numbers, if any, on each, and put them aside. An important book jacket might be deacidified, a process that will be discussed in another pamphlet in this series. It could then be used as a book protector. There is no doubt that a book left in an acid-free wrapper on the shelf remains cleaner than a book that is not jacketed. This same cleanliness can be achieved more safely, however, by applying a Mylar wrapper⊕ to any kind of binding.

SHARP METAL FITTINGS

Before starting to furbish a library, a decision should be made about what to do with books that have metal clasps and bosses. These often damage adjacent books, and they should not be replaced on the shelf without some form of treatment. The best treatment, of course, is to have protective containers made for such books. All books needing this treatment could be put aside under a label reading BOX. A less satisfactory treatment is to slip binder's board or felt pads between the books that have protruding bosses or clasps. Such dividers should be considered only a temporary solution to the problem, since they are likely to be displaced.

LARGE BOOKS

Felt pads give good protection when used between very large books, if these volumes are to be stacked on top of one another. Considerable damage can be done by pulling a heavy book out over a delicate binding. Ideally, each book that is to be stored flat should have its own shelf. If this is not possible, felt pads between each book will give some protection. A protective container is, however, always best.

UNTITLED SLIPCASES

When a book has been stored in an untitled slipcase and either the book or the case needs treatment, they must be separated. It is important to make a record of the title of the book that belongs in the slipcase. The title, call number, or flag number may be written on a sheet of paper which may then be crumpled and stuffed inside the slipcase. It can be a very time-consuming task to try to bring the book and slipcase together again without such a record.

LEATHER BINDINGS

All leather bindings (except for alum-tawed leather [see below]) should be put aside for possible cleaning and for treatment with preservatives. The reasons for using these preservatives, their formulae, and directions for applying them will be dealt with later in this pamphlet.

When separating these leather-bound books from the other bindings, one may come upon artificial leather that is difficult to distinguish from real leather. This leather substitute is made by pressing a plate engraved with the grain of real leather, imperfections and all, into a plastic surface. If you suspect that a covering material may be artificial leather, take it to a good light and examine wear points. These are at the turn-in of the head and tail and at the tips of the corners. Also examine the raw edge of the material where the corners are turned in. If the material is artificial leather, you may be able to detect some of the cloth threads or fiber under the coating. If you are unable to tell the difference and do apply preservatives to a book bound in artificial leather, the leather treatment proposed later in this pamphlet will do the book no serious harm. However, polishing off the oil from these bindings will be difficult, and the material may have to be cleaned with a solvent.

VELLUM AND ALUM-TAWED LEATHER BINDINGS

Be on the lookout for books bound in vellum or alum-tawed leather. These are usually white or cream-colored, although very occasionally one will find a dyed vellum binding. Most vellum has a smooth, hard surface with almost invisible pores. Parchment, a split skin usually of sheep, is ordinarily thinner and weaker; in fact, bindings made of this material often deteriorate quite rapidly.* Alum-tawed leather (usually referred to simply as "tawed" leather) is usually thicker and has a slightly less hard and shiny surface than vellum. The most commonly tawed skins are those of the pig, which have fairly conspicuous pores or hair follicles. The typical alum-tawed pigskin binding will have raised bands, the skin having originally been pliable enough to be stretched. This material was most frequently used between the twelfth and sixteenth centuries. Put books bound in these materials aside, segregated from the other leather bindings. If there are enough of them in the collection, they can be stacked separately. Otherwise, they can be kept with the cloth and paper bindings, as many of their problems are the same.

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* Since, for the purposes of this manual, the procedures for the treatment and repair of vellum and parchment are more or less identical, we shall hereafter refer only to vellum, which should be understood to include parchment also.

INSPECTING CLOTH, PAPER, TAWED LEATHER, AND VELLUM BINDINGS

Having put all non-tawed leather bindings aside, you can concentrate on inspecting the cloth, paper, tawed leather, and vellum bindings. As you spot each problem, you should put the problem book near or under the appropriate label.

BOOKPLATES

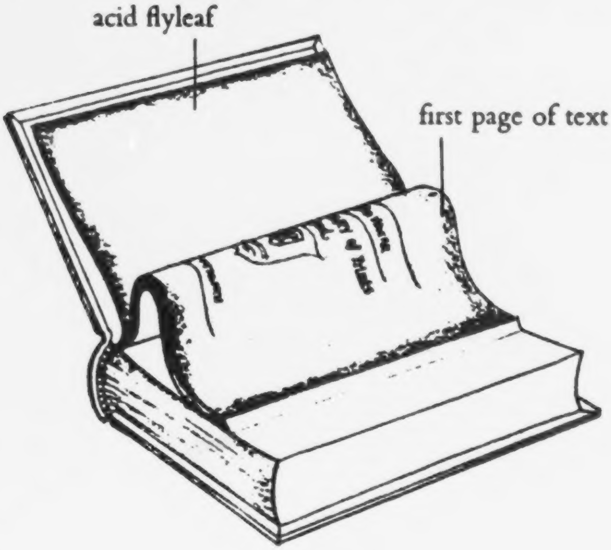
If bookplates are to be inserted in the books, the time to mount the plates is when all the books are off the shelf. This can be done right after they are brought into the workroom and before they are sorted into their various treatment categories. However, bookplates should not be mounted in leather bindings until after treatment, when the hinges will be more flexible. If the books are very dirty, bookplating may be postponed until after cleaning.

ENCLOSURES

Carefully flip through the leaves of the cloth, paper, vellum, and tawed leather bindings, looking for enclosures in each book. Some enclosures will be found which are clearly accidental, such as scraps of paper inserted as bookmarks. These scraps are often made of acid paper and will sometimes be found to have marked the pages. Usually they can be discarded at once. Look for and remove pins, paper clips, and rubber bands. Any mark that they may have made will be most difficult to remove without taking the book apart. It is best to make a note of the damage and to have the damage examined by an expert. Some other kinds of enclosures that will be found are newspaper and magazine clippings, usually stories about the author or reviews of the book; such parts of the book jacket as a biography or picture of the author; or letters from the author. Books with these pertinent enclosures should be put aside under the ENCLOSURE label.

ACID MIGRATION

While examining books, be alert for other kinds of acid migration. These can come not only from enclosures but from acid parts of the book itself. One condition is the presence of so-called protective tissues over the illustrations. These were put into the book to prevent the ink used for printing the illustrations from offsetting onto the pages. These tissues may have turned brown because of acid content, transferring this acid to the illustration and to the opposite leaves. Also be on the lookout for illustrations that have developed the freckle-like spots known as "foxing" and that are staining adjacent leaves. Acid binder's board may also be found. Certain nineteenth-century cloth bindings seem to be afflicted with this condition. A

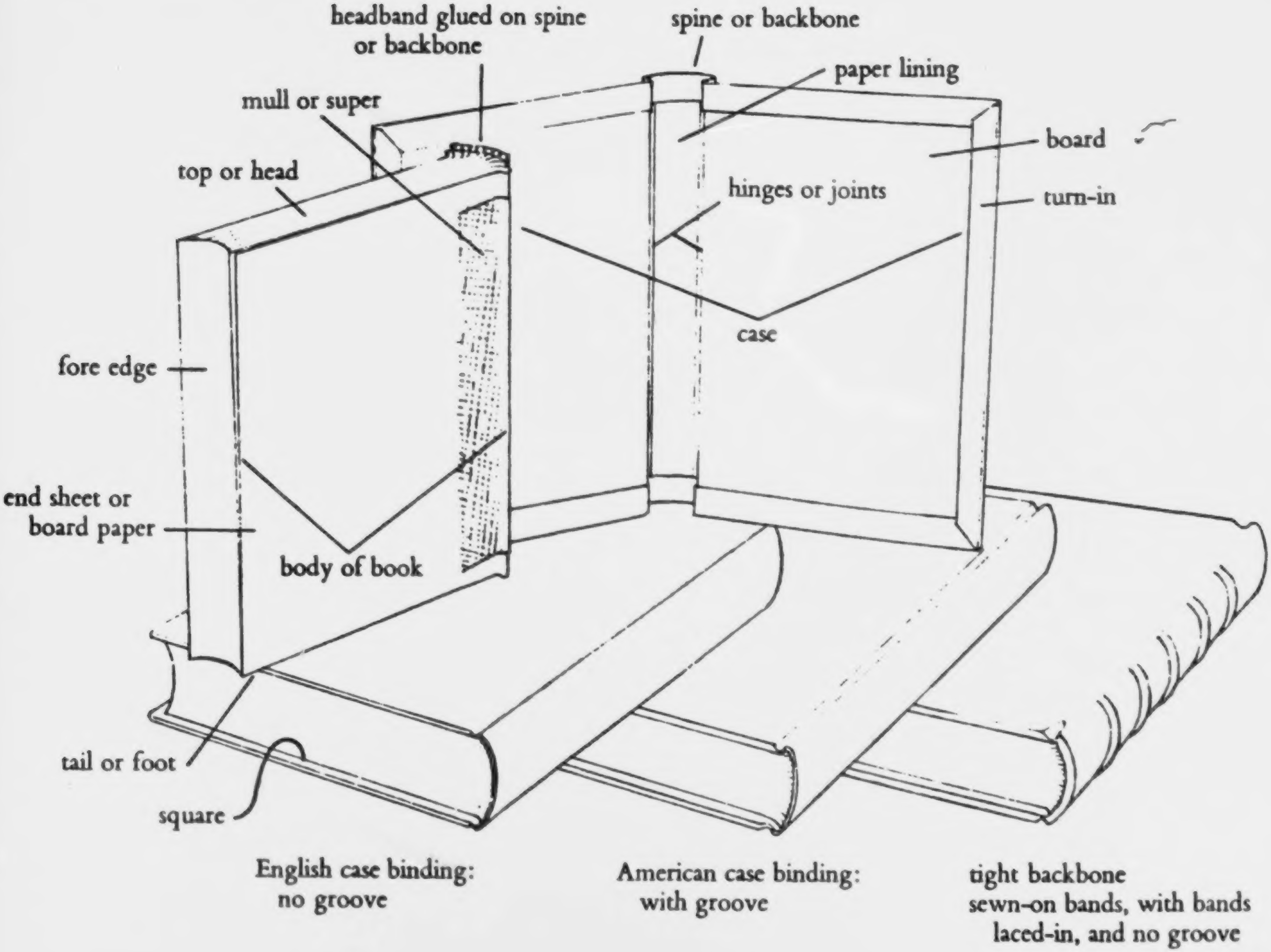


Checking for acid migration from end papers to text pages brown stain will be observed to have traveled through the board paper. Wherever the cloth was turned over the inside of the board, the end paper will not be stained, since the cloth has acted as a barrier to acid migration. Sometimes the acid will have affected several leaves. Some end papers are made of highly acid stock which often has become discolored. The discoloration in turn migrates to the first and last leaves of the text of the book in many instances. Sometimes one can see the end papers turning yellow along the three margins that are exposed to the air. If you arch back the first leaf or so of the book and find that the leaf nearest the acid end paper is definitely changing color in comparison to subsequent leaves, you should set this book aside for treatment. Folded maps are sometimes inserted in pockets in the back of the book. Pull these out and examine them. Sometimes the pocket is made of a cut in the end papers, and the map is held between the end paper and the board. Thus it is partly in contact with the binder's board underneath. If a brown stain appears on part of the map, put this book aside for treatment. Another form of discoloration is the stain on the first flyleaf caused by the turn-in of a leather cover or by leather bookplates. Such stains often travel through several pages. Since steps can be taken to prevent this, books with this problem should also be put aside on the ACID MIGRATION pile.

LEAF REPAIR AND LOOSE PLATES

Check through the books looking for old repairs. Some of these may have been made with pressure-sensitive plastic tape, and books containing such repairs must be set aside for treatment. Some kinds of pressure-sensitive plastic tape leave a stubborn brown stain after even a short period of time. Other kinds begin to ooze at the edges and eventually cause leaves to stick together. Tender old paper has a tendency to break at the edges of the tape. All these tapes should be removed.

The one safe prepared tape to use for repair is Dennison's Transparent Mending Tape⊕, made of glassine paper backed with a water-soluble adhesive. Although the glassine paper eventually turns yellow, it will not stain the repaired leaf itself. A repair made with this material need not be removed.


headband glued on spine or backbone
spine or backbone
paper lining
mull or super
board
top or head
hinges or joints
turn-in
case
fore edge
end sheet or board paper
body of book
tail or foot
square
English case binding: no groove
American case binding: with groove
tight backbone sewn-on bands, with bands laced-in, and no groove

Construction of English and American case bindings, and tight-back book

Be on the lookout for torn leaves. It is common to find that the hinges of folded maps or charts have begun to tear. Look for loose illustrations.

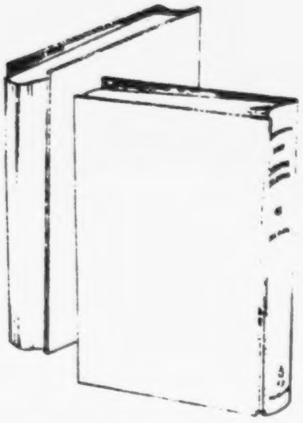
Keep a container of colored strips of paper (flags) and, as torn leaves or plastic-tape repairs, etc., are discovered, slip one into the book to indicate where each repair is needed. These flags can be color-coded, the colors indicating whether an old repair is to be removed or a new tear is to be repaired. Later on, when you are ready to start repair, it will save time not to have to search for the problem leaf.

TIGHTENING BOOKS IN THEIR CASES

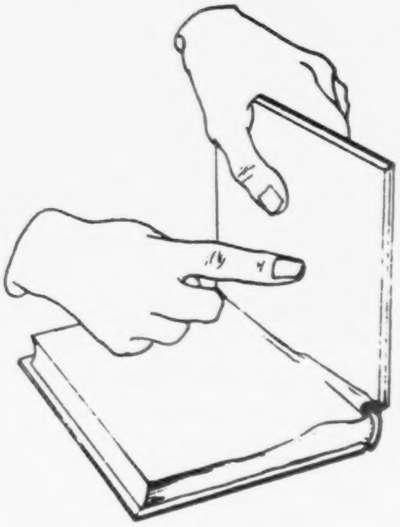
As case bindings are examined, watch for books that are loose in their cases. This condition is very common and can be observed even in books that have never been used or in new books fresh from the publisher. In the manufacture of case bindings, the pages are sewed or secured with an adhesive; a fold of end paper is tipped on front and back, the spine is glued, the edges trimmed and perhaps gilded or colored; the book is rounded and backed and the spine lined with super and a heavy paper lining. Meanwhile, the case is made separately and titled. When both the body of the book and the case are ready, the two parts are brought together. This operation is called "casing-in."

Sometimes a book has not been properly attached in its case. The body of the book will then drag forward and the bottoms of the leaves will touch the shelf. The upper part of the spine will cave in and the end papers will begin to work loose. Eventually these may break at the hinge area so that the super, which lines the spine and which comes out an inch or so over the sides of the book, will be the only thing holding the book in its case. When the super breaks, the book will need recasing or rebinding, and cannot be properly repaired except by a professional binder.

In order to see which books need tightening in their cases, proceed as follows: Lay a book on the worktable. Raise the front cover and suspend it at a right angle to the book. With your right index finger placed just above the inside hinge of the end paper, push the cover as if to push it open, but continue to hold the board perpendicular with the left hand so that the board cannot open out flat. If the book is loose in its case, you will see the spine of the case move away from the backbone of the book and a loose area will appear in the joint under the end paper. Books with this problem should be put aside under a label marked TIGHTEN.



Books loose in their cases



Identifying books that are loose in their cases

CLEAN INSIDE

As you examine books, look for signs of dust that may have sifted down between the pages. This will be found most often where the leaves are rippled, or the boards warped, or the top of the book untrimmed. Vellum books are more likely to be warped than others, so pay particular attention to them. Sometimes dust is found between the end papers, sometimes throughout the entire book. Where a folded map or chart occurs in a book, an opening is often formed that allows dust to sift down between the leaves. Put such books under a CLEAN INSIDE label. Flags should be inserted to indicate the positions of the dusty pages.

CLEAN TOPS

The advantage of having the tops of books gilded becomes apparent when any library is inspected. The gold "seals" the top edges so that dust does not sift down between the pages. Thus they are more easily cleaned. Examine the tops of ungilded books. Many may be quite soiled. Put these aside for special cleaning under a label marked CLEAN TOPS.

OPEN LEAVES

Books are sometimes bound with the leaves untrimmed and the original folds intact. A policy decision should be made by the curator or owner about such unopened leaves or bolts. In any library where the books are allowed to circulate, we recommend that the bolts be opened properly before the books are shelved. Otherwise readers may attempt to open the leaves with a pencil or the fingers and damage the book. Put books with unopened leaves aside under a label reading OPEN LEAVES.

However, if the bolts are dusty or dirty, the books should first go to the pile marked CLEAN TOPS, to be opened later.

CLEAN OUTSIDE

Examine the outsides of the cloth, paper, tawed leather, and vellum bindings for dirt, such as finger marks or grime due to age. Put these books aside for treatment under a CLEAN OUTSIDE label.

COLOR

Sometimes the corners, board edges, head, and tail of the cloth bindings have lost their color. The appearance of books with this problem can be improved by proper recoloring. Such books should be put in the COLOR pile.

SEAL HEADS AND TAILS

Cloth bindings are subject to wear from friction. Usually the first sign of wear is fraying of the threads at the head and tail of the spine. When the coating of the cloth has rubbed off, the exposed threads fray and then begin to break. Next, the cloth at the top of the spine tears away, leaving the hinges vulnerable to being torn.

All cloth bindings should be examined for signs of fraying. When you observe these, put the book aside under the SEAL HEADS AND TAILS label.

LOOSE LABELS

Labels made of paper or leather are occasionally found on cloth, paper, tawed leather, or vellum bindings. Sometimes they are loose or have come off entirely. Put all these books under the LOOSE LABEL heading.

REBUILD CORNERS

Look for broken corners on the cloth, paper, tawed leather, and vellum books. Put these aside under the REBUILD CORNERS label.

STAPLES

When going through a pamphlet collection, you will often find that the staples have rusted and stained the pages. In some cases rust may cause the adjacent paper to disintegrate. Put these stapled pamphlets aside under the STAPLES label so that staples can be removed and the pamphlets properly sewed.

WRITE-UP

Certain books will be found that are obviously in a serious state of deterioration. (If many such books are found and they seem to be deteriorating at a fairly rapid rate, the librarian or collector should undertake a serious investigation of the conditions under which these books are being stored and used to determine what may be causing the damage.) It is important not to attempt to repair or patch such books, unless this can be done correctly. Usually these books must be sent to a professional bookbinder. Some may be candidates for simple cloth binding, while others should perhaps go to a fine binder for restoration or rebinding by hand. Such books may be put aside under the WRITE-UP label. By this we mean that a notation can be made later indicating the fact that this book needs further repair.

After inspection of all the cloth, paper, tawed leather, and vellum books that have been brought into the workroom, large numbers of them often are found to be in good condition. If the collection of books has been receiving regular care and if the library is properly air-conditioned the year round, it may well be that all the cloth, paper, tawed leather, and vellum books can be returned to the shelf with no more than a careful dusting. Other leather books will, of course, require further treatment. The reasons for treating these leather bindings regularly will be discussed later on in this pamphlet.

NEW ENGLAND DOCUMENT CONSERVATION CENTER

Survey Form C-1

(Conditions of the Collections)

Place
Date of Survey By

Name of Collection:

Type of Material:

Stored in Room____________________ on _____________ floor

Manner of storage:

Condition of Collection:
(a) Appearance
Wear and tear
Soil and surface dirt
Water stains

(b) Acid damage
Discoloration________ Embrittlement__________ pH_________

(c) Fungus damage
Spores__________ Staining_________ Pulping______________

(d) Insect damage

(e) Photochemical effect

(f) Other damage

Remarks:

(This form is used to record the data necessary to evaluate the physical and chemical condition of collections prior to determining treatment required. Make a separate sheet for each collection or category of material.)

NEW ENGLAND DOCUMENT CONSERVATION CENTER
Survey Form C-2
Report on Collections

Place____________________
Date of Survey_______________
By________________________

			CONDITION							
Item, type of material or collection	Location	Present Storage: a. Containers b. Cabinets c. Shelves	Wear and Tear	1. Soil 2. Stains	Acid Damage 1. Discoloration 2. Embrittlement	Mildew 1. Spores 2. Stains 3. Pulping	Insect Damage	Photo Chem. Effect	Other Damage	Recommendation

(This form is an alternative method for recording data on the chemical and physical condition of materials. It is most useful for recording data when there are a great number of miscellaneous materials in relatively small quantities compared to the major collections in an institution's stacks.)

Examination

SAMPLE EXAMINATION FORM FOR PAPER OBJECTS

Examination forms are a useful tool for conservators and curators wishing to make a record of the condition of an object at a specific point in time (e.g., upon accessioning or before and after exhibition, loan or travel). Such a record may be useful in detecting subsequent deterioration or damage. It can be of legal assistance in determining ownership in cases of theft. It helps establish information needed for insurance claims.

The form presented here may be used as a guide in developing your own examination form for flat and three-dimensional paper artifacts. This form is, in part, derived from the laboratory examination form found in Anne Clapp's Curatorial Care of Works of Art on Paper. Ms. Clapp's form has been modified to be used by persons documenting the condition of paper artifacts outside the laboratory. A description of the matrix system for locating points on a plane follows the form.

No treatment of objects is suggested herein. Any manipulation of paper is done at your own risk.

Paper object: ______________________

Identification no.(s):

Artist - ______________________

Medium - ______________________

Technique - ______________________

Framing:

Condition photo no.(s)

Materials - ______________________

Structure - ______________________

Mounting, matting, and hinging:

Condition photo no.(s)

Size (inches or millimeters):

Height (maximum) - ____________________ ____________________

Height (minimum) - ____________________ ____________________

Width (maximum) - ____________________ ____________________

Width (minimum) - ____________________ ____________________

Shape: ____________________ ____________________

Thickness (use dial micrometer): ____________ ____________________

Surface character (smooth, matte, shiny, rough, etc.):

____________________ ____________________

Original color of surface (if visible):

____________________ ____________________

Adventitious features:	Length (Inches or mm)	Location (matrix system)	Condition photo no.(s)
1. warp or draw			
2. tear			
3. wrinkle, fold, or crease			
4. Loss (missing part or whole)			

	Length (Inches or mm)	Location (matrix system)	Condition photo no.(s)
5. abrasion			
6. scratch			
7. cleavage or disjoin			
8. crackle or crazing (in medium or in coating)			
9. flaking or chipping (in medium or in coating)			
10. darkening or yellowing of paper			
11. fading or blanching of color in design			
12. stains (water, food, grease, etc.)			
13. insect damage (acretion or surface loss)			

	Length (Inches or mm)	Location (matrix system)	Condition photo no.(s)
14. mold or foxing			
15. identification number, stamp, seal, etc.			
16. other			

Observations made from examination with microscope or other special equipment:

Other relevant information concerning the paper object:

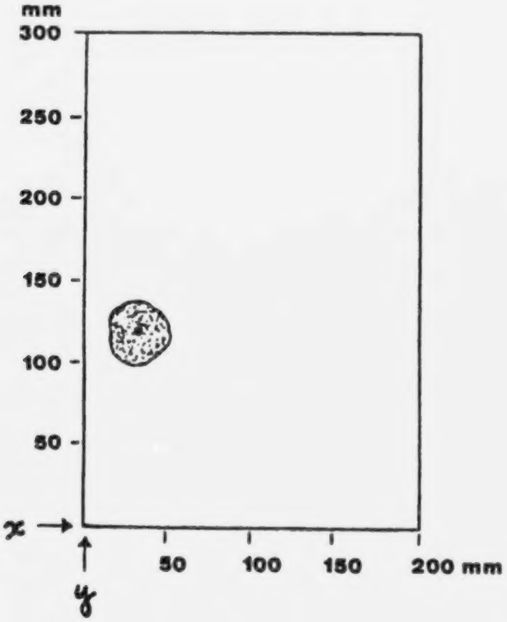
Date of examination: ____________________

Examiner: ________________________________

MATRIX SYSTEM* OF NOTATION

A 'matrix system' of notation is a coordinate system which may be used as a quick and reliable way to locate points or areas on a flat, regular surface.

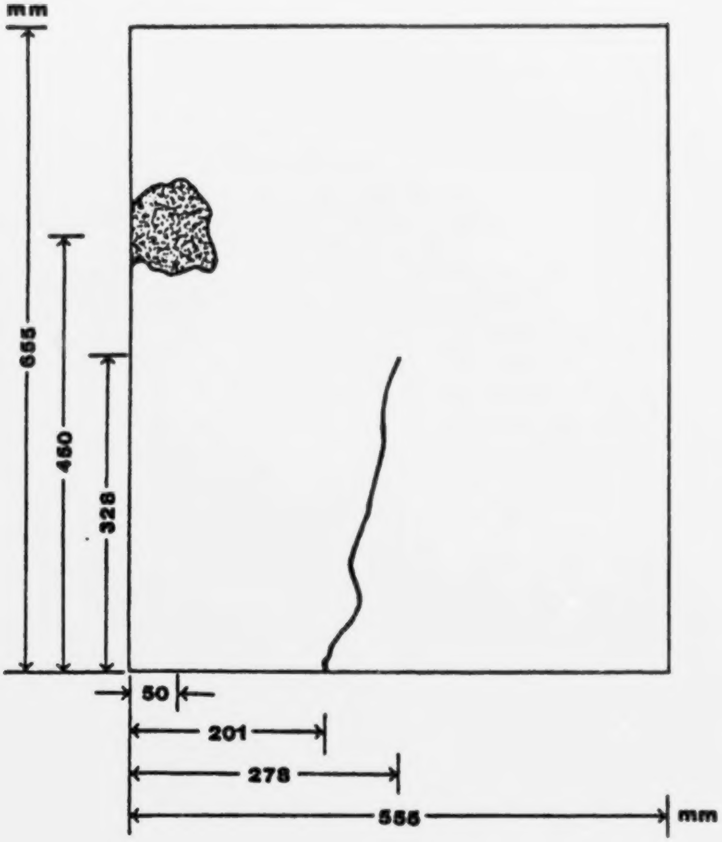
The lower left-hand corner of any four-sided document, for instance, is considered to be the point at which coordinates 'x' and 'y' intersect. By convention, the first and second figures would represent the 'x' and 'y' coordinates respectively, e.g. (x,y).



The location of the stain above, can be described accurately as having its center thirty (30) millimeters horizontally along the 'x' coordinate and one hundred and twenty (120) millimeters up along the 'y' coordinate. The notation on the checklist would be "stain (30,120mm)."

In this system a tear found in the bottom left-hand quadrant of a poster 555mm by 655mm extending from a certain point on the bottom edge to the exact center, would be described as: "tear (201,0) to (278,328)."

A large stain touching the left-hand edge could be described as: "stain, 50mm dia, center (25,45)" as shown in the diagram below.


mm
655
450
328
50
201
278
556
mm

*Robert M. Organ, July, 1976.

source:
NATIONAL PRESERVATION
NEWS: A Newsletter of the
National Preservation
Program Office, The
Library of Congress.
No. 1, July 1985, pp.8-9.

In the Preservation Office . . .

Survey of Book Condition at the Library of Congress

In early 1984, the Library's Preservation Office undertook a careful statistical study of its General and Law collections to determine what portion of the collection could benefit from mass deacidification. The results of the survey were used to help justify a bill to Congress to authorize construction of a book deacidification facility for the Library and to demonstrate the urgency and magnitude of the paper deterioration problem.

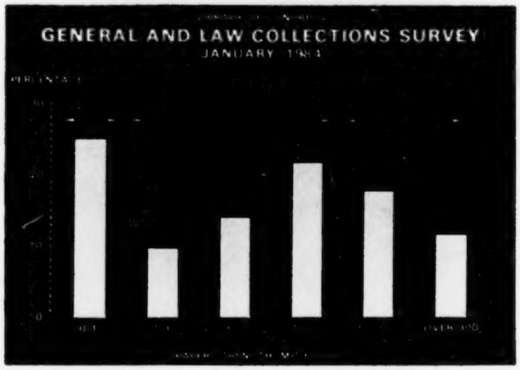
To insure a statistically accurate sample, the Library contracted with King Research, Inc., of Rockville, Maryland, to design a survey methodology and assist in analyzing data. The population to be surveyed included all paper volumes belonging to the permanent classified collection of LC and all bound volumes designated as "Law." Local collections, such as reference, and all rare book collections were excluded from the survey.

A sample size of 1,200 volumes was chosen for the survey because this number could be processed efficiently by Preservation Office staff and would yield a confidence level of 95 percent plus or minus 2.5 percent. Detailed floor plans indicating the locations of each upright section of bookshelves were used to further define the sampling methodology. For each upright sampled, three items were chosen for examination by multiplying the total number of volumes in the upright by three random numbers.

The survey sample was collected by Collections Management Division staff trained by King Research. The methodology called for a series of ten interpenetrating replicate subsamples which were used to control the flow of items for testing and to permit the compilation of preliminary results—useful because of the urgent time frame created by Congressional hearings on the mass deacidification facility.

As the sample was collected, each book was examined by Binding Office personnel who noted the condition of the binding, the call number, and the imprint date and removed a half-inch strip of paper from the outside margin of a page selected by multiplying the total number of pages in the book by a random number. In the Preservation Research and Testing Office, the strips were subjected to an MIT folding endurance test. A slight modification of the standard MIT test was necessary due to the small amount of sample available and the nature of the paper being tested. Paper samples were also tested in the Conservation Office for acidity using narrow range color indicator pH strips, and for lignin content using phloroglucinol solution, which turns magenta in the presence of groundwood fiber.

In addition to the central question of "What percentage of LC's 13 million books in the General and Law collections could benefit from deacidification?," the survey was used to answer other questions concerning book condition. For example, the test for folding endurance showed not only what percentage of books were too brittle to benefit from deacidification, but also the range of paper strength in the collection. As time goes on, a larger and larger percentage of books will become embrittled, requiring transfer to a secondary preservation format such as microfilm.



Variation in the strength of book paper in the General and Law Collections of the Library of Congress.

The survey results very clearly showed that large portions of the collections of the Library of Congress would benefit from mass deacidification. These results will allow the Library to plan in a systematic way to address the problem of adding materials to the collections that are destined to deteriorate because of the acid content of their paper. P.L. 98–396 approved August 22, 1984, appropriated $11.5 million to construct the Library of Congress Mass Deacidification Facility. Construction will begin in early 1986 and it is expected that the facility will be ready for operation in late 1987.

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The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library

Gay Walker, Jane Greenfield, John Fox, and Jeffrey S. Simonoff

A large-scale survey of the physical condition of books and the nature of the collections in the Yale University Library system that evaluated more than 36,500 volumes was carried out. Results have been tabulated, compared by computer, and analyzed to provide statistical information on the fifteen distinct collections surveyed in thirty-six separate strata. Environmental conditions were also monitored. These studies, along with the analyses of binding materials and methods, were used to formulate probable reasons for deterioration levels as well as documenting these levels. Several questions of particular interest were compared in two-way intersections, and a brief analysis was made of publication dates in relation to age and condition of a selected group of books. It was found that 37.1 percent of the books sampled overall had brittle paper (i.e., broke after two double folds) and that 82.6 percent of the books overall had acidic paper (i.e., a pH of below 5.4). These and other results should help Yale and libraries elsewhere to identify their preservation needs and develop appropriate programs.

One of the most serious problems facing research libraries today is the preservation of the materials that comprise their collections—materials that are deteriorating because of their chemical composition, the mechanics of their construction, and the effects of uncontrolled environmental conditions. Deterioration is a particularly critical problem in large libraries, where the age and size of the collections make evaluation and corrective action difficult. It has been estimated that more than six million volumes in the collections of the Library of Congress have deteriorated so badly they cannot be given to users without risk of irreparable damage;[1] at the New York Public Library, it is estimated

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R. Gay Walker is head of the Preservation Department and curator, Arts of the Book, Yale University Library, New Haven, Connecticut 06520. Jane Greenfield, now retired, was past conservator and head of the Conservation Studio, Yale University Library. John Fox is a graduate student, Statistics Department, Yale University. Jeffrey S. Simonoff was a graduate student in the Statistics Department, Yale University, at the time of this survey. He is presently on the faculty of the Graduate School of Business Administration at New York University, New York 10012. *The authors would like to acknowledge financial support for the design and implementation of this survey from the National Endowment for the Humanities (#RC-32954-79-1585) and the Mellon Foundation. Those interns involved in the survey were Paul Beck, David Boardway, Charlotte Brown, Candace Brugmann, Diane Burke, Margaret Byrnes, Ellen Chin, Anne Dutlinger, Patricia Gladys, Sharlane Grant, Nancy Grussing, Michael Holland, Cheryl Jones, Lynne Keller, Margaret Madison, Jan Merrill-Oldham, Marion Munzer, Carolina Portela, Sharon Pugsley, Mary Schlosser, Pamela Spitzmueller, Gregor Trinkaus-Randall, Karen Walsh, and Virginia Wisniewski-Klett. Special thanks go to Jan Merrill-Oldham for her careful editorial review and suggestions. Thanks also go to Rutherford D. Rogers and the Yale Library's administration for local support, to Louis J. Volpi, and to the staffs of the Preservation and Conservation divisions for their participation and support.*

that as much as half of the collection has reached a similarly advanced state of disintegration.[2]

During the past decade, several attempts have been made to explore this problem, and a variety of responses to it have been initiated. The first major study was conducted by the Association of Research Libraries; it attempted to "identify specific steps that might be taken . . . to work towards resolution of the many problems . . . brought on by the physical deterioration of books and journals."[3] Authors treating this subject included Darling[4] and Walker,[5] both of whom urged more complete documentation of preservation activities. Several major libraries, including New York Public, Columbia University, Stanford University, University of California at Berkeley, University of Michigan, Newberry, and Yale University libraries, have formed preservation units for the purpose of repairing and replacing damaged books and journals. Outstanding recent developments have been initiated by the Library of Congress, where a pilot project on the storage of information in digital form is under way and where the Preservation Research and Testing Office is conducting extensive research on the permanence of materials, practical methods for mass treatment of deteriorated books, and the effects of buffering agents on papers and inks.

Those institutions that have attempted to address the preservation problem have been hampered by the lack of a detailed study to determine its scope. Although small, limited surveys were conducted at Stanford University[6] and at several other academic libraries, a large-scale study had never been attempted. In 1979, the Preservation/Conservation group at Yale applied for and received a three-year grant from the National Endowment for the Humanities (NEH) to survey the Yale collection, evaluate the results, develop educational tools, and provide interns with advanced training in preservation/conservation procedures and theories. Additional support was provided by the Andrew W. Mellon Foundation. The grant was administered by project codirectors, Jane Greenfield and Gay Walker.

The proposed survey was undertaken to determine the extent and nature of the deterioration of books in the Yale University Library system. This was a job of major proportions; Yale Library has the second largest collection of any academic library in the nation. In 1982, 7,725,424 volumes were held in forty separate library units. The records for that year show that more than one million volumes had circulated. This figure does not reflect in-house use of materials. In order to obtain results in which we could be confident, a very large sample—more than 36,500 volumes—was surveyed. Fifteen of the sixteen major libraries were divided into thirty-six subunits, each of which was treated separately in terms of its statistical framework and the generation of results. The surveyed libraries varied greatly in size, age, and nature of buildings and collections; environmental conditions; reader access; and circulation patterns. The following descriptions of some of the surveyed units illustrate this point.

The Sterling Memorial Library (the main library) houses approximately four million volumes, including some that date back to 1600. The collection has grown steadily since 1701, when the university was founded. Opened in 1931, the building has fifteen floors of stacks accessible to the Yale community, a centrally controlled heating system, and no air-conditioning. Among the subunits within the Sterling Library that were sampled separately was the Preservation Division. The 13,000 books held there represent the work flow of materials regularly sent to Preservation for repair, replacement, or reproduction. The 3,359-volume Statistics Library (the smallest library sampled) is located in one room of what was once a private house, built in 1849. The Cross Campus Library, a two-floor, air-conditioned underground structure built in 1971, houses 150,000 volumes. This undergraduate collection receives the heaviest use of any within the library system. The Kline Science Library is comprised largely of twentieth-century periodicals and recent scientific texts (the older science materials are in the Sterling stacks). Because it was felt that rare books should not be tested for pH and brittleness, none were surveyed. The major unit omitted was the Beinecke Rare Book and Manuscript Library. Folios were also omitted because they are awkward to handle and are easily damaged.

SURVEY GOALS

The survey was designed to yield a detailed description of the collections in the discrete units of the Yale system; to examine the complex relationships between the nature of materials, their condition, and the environment in which they are housed; and to estimate how many volumes require immediate attention, how many will need attention soon, and what kind of attention will be needed. In order to gather the requisite data, the project codirectors devised a series of questions that could be used to evaluate books. Eight of these questions helped to establish the size of the preservation problem:

1. Is the primary protection (binding, box, or protective cover) intact?
2. Is the leaf attachment (sewing, gluing, or stapling together of pages) intact?
3. Is the paper very brittle (does the corner of a page break off after two double folds—i.e., after being folded in one direction, then in the opposite direction, twice)?
4. Is the paper very acidic (i.e., does a test using an archivist's pen filled with bromocresol green show the paper to be pH 5.4 or below)?
5. Is the printed area of all pages intact?
6. Is the book mutilated (i.e., damaged by humans or animals)?
7. Is the book damaged by environmental factors (i.e., are there signs of fading or water damage)?
8. Does the volume require immediate treatment (replacement, reproduction, repair, or rebinding)?

Other questions were devised to expand the profile of the deteriorated volumes and to suggest reasons for their deterioration:

9. What is the country of publication?
10. What is the date of publication?
11. Is the book circulating or noncirculating?
12. What kind of primary protection (binding, box, wrapper) does the book have?
13. What kind of material covers the joint (the outer hinges)?
14. How are the leaves of the book attached?
15. What is the width of the gutter (inner) margin?

Most questions are of particular interest as they intersect with others. Among those sets analyzed were questions 1 and 12, 2 and 14, 3 and 4, 3 and 8, 3 and 15, 4 and 14, 4 and 15, 8 and 12, 8 and 13, and the three-way intersection of 3, 9, and 10. See appendix A for the sampling methodology and procedures.

THE PILOT STUDY

An important step in the construction of the Yale survey was a pilot survey, that is, a preliminary run-through on a small subset of the total number of volumes to be sampled. The pilot helped identify and eliminate problems in the sampling design (for instance, it was discovered that certain questions were worded ambiguously). A pilot study of 1,000 books in one stratum was carried out. This was a number large enough to achieve the desired objectives but small enough so that the study could be done quickly and analyzed inexpensively.

The pilot study emphasized the need for the following: (*a*) a consistent method of locating books, e.g., by always moving clockwise around a range when counting sections; (*b*) detailed instructions on how to fill out questionnaires and guidelines for answering the questions; (*c*) a knowledge of book structure and the ability to recognize different methods of leaf attachment and the various materials used for book covering.

The educational program for the surveyors and the instructions for locating books and evaluating them (see appendix B) were evolved during the trial run. A truck of books containing various binding styles and covering materials was assembled for each group of NEH intern surveyors to study. The surveyors also spent time in the stacks practicing evaluation techniques to standardize findings, and they attended a discussion session at which the statisticians explained statistical theory. After a surprisingly short period of practice, each group was able to work smoothly and efficiently.

IMPLEMENTATION

Six groups of four interns each carried out the survey over the course of two and one-half years. Each group stayed at Yale for five months and spent close to half of each day surveying. The total time spent evaluating books was about thirty-eight hundred hours.

College Board form IBM-H45352 was used to record findings in a machine-readable format. This procedure eliminated errors that are sometimes introduced when data must be input into a computer manually. An overlay of thin cardboard (figure 1) with windows cut out to expose areas where answers were to be recorded was placed on the survey form. The form and overlay were supported in correct relative position by a jig (figure 2) that also held finished forms, the thin cardboard strip used to measure gutter margin, #2 pencils needed to fill in the form, and an archivist's pen used to check pH. A short list of abbreviations for names of countries (appendix C) was taped on

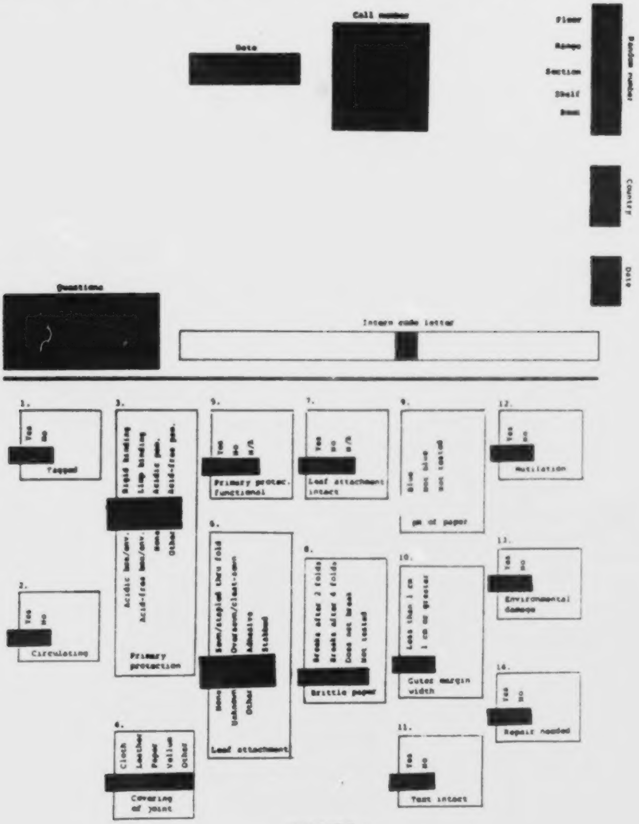
Date
Call number
Floor
Range
Section
Shelf
Book
Random number
Country
Date
Questions
Intern code letter
1.
Yes
No
Tagged
2.
Yes
No
Circulating
3.
Rigid binding
Limp binding
Acidic pam.
Acid-free pam.
Acidic box/env.
Acid-free box/env.
None
Other
Primary protection
4.
Cloth
Leather
Paper
Vellum
Other
Covering of joint
5.
Yes
No
N/A
Primary protec. functional
6.
Sewn/stapled thru fold
Oversewn/cleat-sewn
Adhesive
Stabbed
None
Unknown
Other
Leaf attachment
7.
Yes
No
N/A
Leaf attachment intact
8.
Breaks after 2 folds
Breaks after 4 folds
Does not break
Not tested
Brittle paper
9.
Blue
Not blue
Not tested
pH of paper
10.
Less than 1 cm
1 cm or greater
Gutter margin width
11.
Yes
No
Text intact
12.
Yes
No
Mutilation
13.
Yes
No
Environmental damage
14.
Yes
No
Repair needed

FIGURE 1

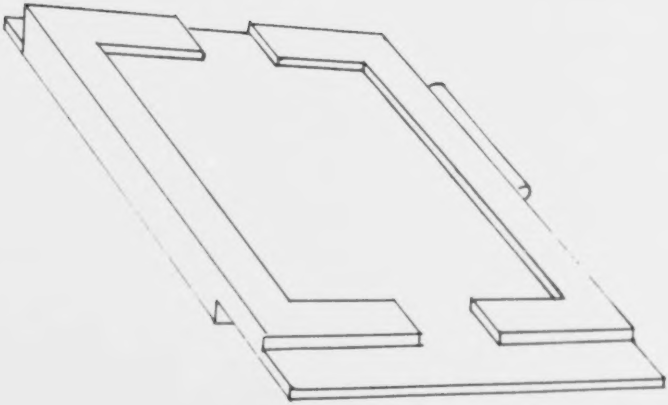

FIGURE 2
Jig to Hold Overlay and Evaluation Form in Alignment

the back of the jig. In addition, a full list of abbreviations, translations of Latin and Cyrillic place-names, an atlas, and shelflists were available.

RESULTS

Appendix D gives the statistical analysis of the data gathered. The sample results for each of the fifteen libraries surveyed are presented in the tables in figure 3. Findings for thirteen questions are expressed as percentages; answers to the question about tagging are omitted (this figure was always under 10 percent, as mentioned before). Great care was taken to obtain sufficiently large sample sizes to ensure that our estimates were accurate to within a few percentage points. The *maximum* standard error observed for each of the thirteen questions listed in the tables is given at the top of each column. Although the highest standard error in an entire unit was 2.58 percent (in the Statistics Library, where the smallest sample was taken), most were well under 1 percent. For questions with several possible answers, e.g., "How are the leaves attached?" only those answers comprising at least 2 percent of the total response in any stratum were included in the tables. The percentages, therefore, do not always add up to 100 percent in each category. Libraries having air-conditioning are indicated in the tables.

The following example illustrates how survey results should be interpreted. Refer to the first table in figure 3, Art Library column. In a sample of 1,336 volumes, 17.2 percent were found to be in need of treatment. (Given the calculated standard error of 1.03 percent for the question about repair, a 99 percent confidence interval for the actual percentage of books in the Art Library in need of treatment is 14.53 percent to 19.87 percent.)

The survey findings were very interesting—some because they confirmed previous estimates of the scope of the preservation problem, and others because they provided new data with which to analyze the problem. Salient aspects of these results are discussed below, question by question. (Because the Sterling sample was the largest, statistics from that collection are most often cited. Findings from other strata are mentioned when they are of particular significance.)

Is the Primary Protection Intact?

The data gathered in response to this question can help identify those collections that would be good candidates for rebinding projects. Findings also suggest levels of use and maintenance of a given

Total holdings	75,775	19,165	22,357	29,250	130,001	100,315	170,116
Sample size	1,336	898	965	1,032	1,079	1,964	1,588
Max. standard error (%)	1.36	1.66	1.56	1.54	1.52	1.13	1.28
Library	Art	Classics	Drama	Engineering*	Forestry	Geology*	Kline Science*
Circulating	11.1	1.9	62.6	56.7	65.1	3.2	46.1
Non-circulating	88.6	97.9	36.9	43.3	34.9	96.7	53.9
Primary protection type							
Rigid	55.2	94.1	66.3	75.0	46.7	89.6	85.9
Limp	37.7	4.1	22.0	24.7	34.9	1.0	9.8
Acidic pamphlet	4.8	0.5	9.4	0	13.7	7.6	3.8
Primary protection condition							
Intact	86.2	89.0	92.8	96.3	79.9	96.7	90.8
Not intact	13.4	10.6	6.9	3.4	19.7	3.1	9.0
Joint covering							
Cloth	60.4	90.0	69.8	74.4	58.7	89.5	85.2
Paper	33.5	5.6	23.7	24.5	35.0	3.4	9.7
Leather	1.4	1.6	2.0	0	0.6	0.7	2.4
Leaf attachment type							
Sewn-through-fold	44.5	56.2	61.9	57.4	44.8	56.0	46.1
Over/cleat sewn	28.6	37.9	13.9	33.1	24.6	27.4	40.0
Stabbed	10.7	1.6	10.0	2.3	13.6	1.7	4.8
Adhesive	8.4	2.8	8.7	5.1	9.5	12.3	7.9
Leaf attachment condition							
Intact	94.6	89.1	91.6	98.2	90.6	96.3	97.5
Not intact	3.1	9.6	6.0	1.5	4.9	2.1	2.0
Text condition							
Intact	96.1	95.3	94.5	98.6	94.0	97.8	99.0
Not intact	1.5	3.8	2.4	1.2	1.5	0.7	0.5
Brittle							
Does not break	81.5	64.0	77.8	93.3	71.1	89.4	73.4
Breaks at 4 folds	7.1	11.9	10.3	3.0	8.3	3.5	6.0
Breaks at 2 folds	9.2	23.2	7.7	3.3	16.0	5.5	20.1
pH							
pH above 5.4	22.6	16.9	33.2	33.5	17.1	48.0	32.0
pH below 5.4	75.1	82.1	63.9	66.2	78.4	50.3	67.4
Gutter margin							
1 cm. or more	66.5	70.2	76.7	69.5	68.2	60.9	75.4
Less than 1 cm.	31.4	29.1	21.1	30.1	27.4	37.5	24.1
Mutilated							
No	99.0	97.9	98.0	98.6	98.4	95.5	98.4
Yes	1.0	2.1	2.0	1.4	1.5	4.5	1.5
Environmental damage							
No	92.4	83.5	96.9	94.5	89.4	98.7	98.8
Yes	7.5	16.5	2.9	5.5	10.2	*1.3	1.1
Treatment needed							
No	82.7	83.3	88.7	95.5	75.8	95.3	89.7
Yes	17.2	16.7	11.2	4.5	24.1	4.7	10.2

*Air-conditioned libraries

FIGURE 3
Sample Results (%)

Total number	3.1 mil	18,000	1,500	13,000	5 mil.
Sample size	17,096	300	222	528	36,512
Max. standard error (%)	0.38	2.70	3.35	2.17	0.30
Library	Sterling stacks (15 floors)	Reference	Periodical stacks	Preservation	Yale Overall
Circulating	97.2	0	0	0	87.2
Non-circulating	2.5	100	100	100	12.5
Primary protection type					
Rigid	75.3	91.7	96.0	86.0	76.0
Limp	7.5	4.7	1.4	10.0	9.7
Acidic pamphlet	12.8	0.7	2.7	3.2	11.0
Primary protection condition					
Intact	91.8	95.3	94.1	20.1	91.4
Not intact	7.6	3.7	5.9	79.6	8.1
Joint covering					
Cloth	75.3	74.0	96.4	54.7	76.9
Paper	9.8	6.0	1.4	10.4	11.3
Leather	6.8	7.7	2.3	33.1	5.4
Leaf attachment type					
Sewn-through-fold	51.7	67.7	23.0	78.6	52.4
Over/cleat sewn	22.5	21.3	69.8	10.6	24.6
Stabbed	17.7	3.0	5.9	8.9	13.7
Adhesive	4.8	7.3	1.4	1.3	6.3
Leaf attachment condition					
Intact	92.5	94.0	94.6	54.9	93.6
Not intact	4.4	5.3	5.0	44.5	4.0
Text condition					
Intact	94.4	95.7	88.3	52.1	95.4
Not intact	2.2	1.7	11.3	47.4	2.0
Brittle					
Does not break	50.8	74.0	52.3	13.8	59.4
Breaks at 4 folds	8.8	7.0	11.3	8.0	8.2
Breaks at 2 folds	35.9	18.3	36.0	69.3	28.9
pH					
pH above 5.4	8.3	24.7	15.3	2.1	13.7
pH below 5.4	87.0	74.3	83.8	89.0	82.6
Gutter margin					
1 cm. or more	75.9	79.3	65.3	88.3	75.2
Less than 1 cm.	21.2	20.0	34.2	11.0	22.5
Mutilated					
No	96.5	97.7	85.6	90.0	95.9
Yes	3.1	2.3	14.4	9.7	3.8
Environmental damage					
No	95.3	100	98.7	81.3	95.8
Yes	4.3	0	1.4	18.4	3.9
Treatment needed					
No	86.5	90.7	82.4	3.2	87.0
Yes	13.2	9.3	17.6	96.6	12.8

*Air-conditioned libraries

FIGURE 3 (Continued)
Sample Results (%)

Total number	652,896	24,604	272,215	117,021	115,416	3,359	150,000
Sample size	2,923	1,026	1,507	1,266	1,129	364	1,289
Max. standard error (%)	1.03	1.55	1.29	1.30	1.48	2.58	1.30
Library	Law	Mathematics	Medicine	Music	Social Science*	Statistics	Cross Campus*
Circulating	99.1	97.3	56.9	81.6	76.9	94.0	98.3
Non-circulating	0.7	2.0	43.0	18.2	23.1	4.1	1.2
Primary protection type							
Rigid	87.2	84.8	67.2	69.3	45.2	74.7	94.8
Limp	7.3	8.0	28.1	1.2	14.5	23.6	0.1
Acidic pamphlet	4.7	6.8	2.3	27.8	36.9	0.6	4.3
Primary protection condition							
Intact	92.5	97.2	88.1	97.2	92.6	97.5	93.2
Not intact	7.1	1.9	11.5	2.4	7.2	1.4	5.8
Joint covering							
Cloth	84.4	82.4	67.6	95.7	72.5	71.7	90.7
Paper	7.2	12.6	27.7	2.0	18.3	25.8	3.1
Leather	6.4	3.0	0.5	1.2	0	0.8	0.2
Leaf attachment type							
Sewn-through-fold	53.3	40.0	50.5	75.4	34.6	67.6	71.5
Over/cleat sewn	32.0	44.9	31.7	13.2	12.9	19.0	12.3
Stabbed	7.7	5.6	4.8	4.6	21.3	2.5	5.7
Adhesive	5.7	8.4	10.0	4.2	27.6	9.6	10.0
Leaf attachment condition							
Intact	96.9	98.1	93.7	94.2	97.3	98.1	97.3
Not intact	2.4	1.7	3.8	4.6	2.6	0.6	2.0
Text condition							
Intact	98.1	99.1	96.4	95.4	98.9	97.8	98.0
Not intact	1.2	0.4	1.1	3.8	0.9	0.6	0.9
Brittle							
Does not break	54.2	74.7	87.7	82.2	96.6	95.6	91.1
Breaks at 4 folds	9.9	9.8	6.0	7.4	2.0	3.6	3.5
Breaks at 2 folds	33.7	15.0	3.9	9.6	1.3	0	4.9
pH							
pH above 5.4	9.5	10.3	40.5	8.6	25.0	40.9	30.3
pH below 5.4	88.3	89.4	57.1	90.4	74.8	58.8	67.9
Gutter margin							
1 cm. or more	80.4	61.8	67.1	73.8	63.2	86.0	84.6
Less than 1 cm.	18.8	37.6	30.3	25.5	36.7	13.5	14.7
Mutilated							
No	96.3	95.1	98.0	90.1	97.9	99.7	74.6
Yes	3.5	4.7	1.9	9.9	2.1	0.3	25.0
Environmental damage							
No	97.0	97.2	97.5	98.4	96.8	99.2	98.4
Yes	2.8	2.6	2.3	1.5	3.2	0.8	1.2
Treatment needed							
No	90.4	96.8	85.3	92.8	88.8	98.1	85.2
Yes	19.5	3.0	14.6	7.0	11.2	1.9	14.4

*Air-conditioned libraries

FIGURE 3 (Continued)
Sample Results (%)

collection. More than 7 percent of the sample surveyed in the Sterling stacks had broken bindings (which represents around 235,000 volumes if extrapolated to the entire stack holdings). Surprisingly, the percentages of volumes with broken bindings in the high-use Periodical and Reference collections were lower (5.9 percent and 3.7 percent, respectively), which is perhaps a function of the Reference staff's prompt processing of materials in need of rebinding. Predictably, nearly 80 percent of volumes in the Preservation Division had bindings that were not intact. More than 10 percent of the volumes in the long-established Forestry, Medicine, and Classics libraries had broken bindings—the Forestry Library having the largest percentage (19.7 percent); while the new collection in the Geology and Engineering libraries had very few broken bindings. However, the low numbers at Music (an old collection), and the high numbers at Kline and Art (relatively new collections), suggest that level of usage and care may also be important factors for predicting binding condition.

Is the Leaf Attachment Intact?

The condition of the leaf attachment suggests the levels of use and maintenance of a collection, as does the condition of the primary protection, but the implications of leaf-attachment problems can be more serious. The text blocks of books with broken leaf attachments must be resewn or reglued, procedures that are not possible when margins are narrow or paper is brittle. The condition of leaf attachments was reasonably good throughout the library system. As might be expected, 44.5 percent of the volumes in the Preservation Division had leaf-attachment problems, but percentages in the remaining units ranged from 0.6 percent to 9.6 percent.

Is the Paper Very Brittle?

The test for paper embrittlement produced the most significant results of the survey. Brittle volumes cannot be easily rebound or repaired, cannot withstand photocopying or heavy use, and would not benefit appreciably from deacidification. The test for embrittlement is fairly objective: the corner of a page was folded back and forth four times (two double folds). If the corner broke off after one double fold, the paper was considered extremely brittle; after two double folds, brittle. Of the books surveyed in the main Sterling stacks, 44.7 percent did not survive the four-fold paper test—a percentage that represents between 1,351,600 and 1,420,420 books. As might be expected, more of the paper in the Preservation Division collection was brittle (77.3 percent). Most of the older collections contained a high percentage of brittle books. Of the materials in the Periodical stacks (where back files of the 100 most heavily used titles are shelved), 47.3 percent were embrittled. The two collections that had the lowest percentage of brittle books, Social Science (3.3 percent) and Statistics (3.6 percent), are relatively new. When results for the entire Yale Library system's holdings were weighted and combined, a total of between 1,796,100 and 1,879,377 volumes were estimated to have brittle paper. These findings signal the need for expanded replacement and reproduction programs.

Is the Paper Very Acidic?

The pH is important because of the established correlation between paper acidity and longevity. In general, the more acidic the paper, the more short-lived it is. Determining the percentage of acidic materials in a collection is useful for predicting long-range preservation needs. We measured acidity using a simple pH indicator. A small mark was made in the gutter margin of each book using a felt-tipped pen filled with bromocresol green. The chemical is green when applied but turns blue within about thirty seconds if the pH of the paper is above 5.4. Since a pH of 5.4 or below is *very* acidic (i.e., well below neutral), the percentage of acidic books identified in the survey is conservative. We approached these results with some caution because color changes are sometimes hard to read in dim stack areas; however, the results *did* corroborate similar findings in other studies. In no library unit did more than 48 percent of the paper tested have a pH higher than 5.4. Those collections with the largest percentages of better paper were generally the newer ones. In the Sterling Library, 87 percent of all papers tested had a pH of under 5.4. We can estimate, then, that about 2.57 million volumes in Sterling have acidic paper and are either brittle or will become brittle. In the Cross Campus and Kline Science libraries, 68 percent and 67 percent, respectively, of the paper tested was highly acidic. We had expected this lower percentage, since the bulk of both collections is late-twentieth-century material. When the estimates for each stratum in the survey are weighted and the results added together, the total number of items having highly acidic paper in the five-million-volume target population is between 4,065,192 and 4,128,542 (82.6 percent).

Is the Printed Area of All Pages Intact?

The identification of pages with tears or breaks extending into the text is significant because of the immediate potential for loss of information. The Periodical stacks showed severe damage; 11.3 percent of the books sampled had broken or torn paper. As might be expected, 47.4 percent of the volumes sampled in the Preservation Division had damaged paper. However, the results from all other units were low, e.g., only 2.2 percent of the books surveyed in Sterling showed damage to printed areas of pages.

Is the Book Mutilated?

Extensive mutilation suggests heavy reader use. The problem was moderate throughout the library system, with the exception of the Cross Campus Library, where 25 percent of the books sampled were mutilated. (The Cross Campus Library contains all class texts including items placed on reserve.) The Periodical stacks, the Preservation Division collection, and the Music Library showed mutilation rates of 14.4 percent, 9.7 percent, and 9.9 percent, respectively, while all other collections showed rates of under 5 percent. These findings identify sites where augmented programs for reader education are necessary.

Is the Book Damaged by Environmental Factors?

Damage to books caused by environmental factors (e.g., water, sunlight, mold, insects) indicates problems with physical housing, including building construction, environmental control, and housekeeping practices. As might be expected, the Preservation Division collection showed the highest rate of environmental damage (18.4 percent). Other collections showing high rates were the Classics Library (16.5 percent) and the Forestry Library (10.2 percent). The median for all strata was 2.9 percent. Some collections have been repeatedly damaged by water from leaking pipes or windows, overflow from sinks, condensation from steam heating units, or rainwater seeping through walls and ceilings. In some undetected cases, mold had grown, exacerbated by high heat and humidity.

Does the Volume Require Immediate Treatment?

The results of this question identified those library units that have the greatest numbers of deteriorated volumes in need of immediate attention—that is, volumes with broken bindings, missing or damaged text, and/or broken leaf attachments. (Intact brittle materials were not included; only those already damaged were identified here.) Surprisingly, the percentage of books needing immediate treatment was much lower than we had believed. (We had estimated that roughly 30 to 40 percent of all items in Sterling would fall into this category.) Although 96.6 percent of the books surveyed in the Preservation Division collection needed immediate treatment, in no other library was this figure higher than 25 percent. In the Sterling stacks, only 13.2 percent of the materials fell into this category. It should be noted, however, that this percentage represents more than 400,000 volumes. More than 10 percent of the collections sampled in Sterling's Periodical stacks, and the Cross Campus, Art, Classics, Drama, Forestry, Kline Science, Law, Medicine, and Social

Science libraries, were also identified as needing immediate treatment.

Is the Book Circulating or Noncirculating?

The question regarding circulation was included to determine whether there is a relationship between the condition of the books and circulation outside the library. Surprisingly, no clear correlation was found—need for treatment being more closely related to age and nature of the collection. For example, the Classics Library is a noncirculating collection but showed a high number of volumes needing treatment, while other circulating collections showed a low rate of damage.

What Kind of Primary Protection Does the Book Have?

Identifying and quantifying the types of primary protection (including bindings, boxes, envelopes, and wrappers) are useful for estimating the number of volumes in need of first-time binding and the number of acidic pamphlet binders that must be replaced by alkaline binders. The most common primary protection was the rigid binding (hard covers that provide firm support). The percentage of rigid bindings varied throughout the library system, from 45 percent to 96 percent. Also common were limp supports (paper or other flimsy covers) and acidic pamphlet binders. The percentage of limp bindings varied from 0.1 percent to 38 percent. In those few libraries where the number of limp bindings is high, a review of binding policies may be appropriate. The percentage of acidic pamphlet binders ranged from 0 percent to 36.9 percent throughout the system. The estimated number of these binders in Sterling alone was 396,800 (12.8 percent).

What Kinds of Materials Cover the Joint?

Identification of the materials covering the joints (the outer hinges) of books helps to describe library collections, particularly when it is coupled with information about condition. Because of the degree to which joints must flex, they are extremely vulnerable to failure. The nature of the material covering the joint is therefore critical to the durability of the binding. Thirty-three percent of the books awaiting treatment in the Preservation Division were bound in leather. Since the highest percentage in any other collection was 7.7 percent and the median was 1.7 percent, this finding suggests that leather is more fragile than other binding materials. (It is also difficult to repair.) The large number of books with paper-covered joints may represent a future binding problem, although many of the pre-nineteenth-century paper bindings have held up extremely well.

How are the Leaves of the Book Attached?

The method by which the leaves of a book are held together (e.g., sewing-through-the-fold, oversewing, gluing) is an important factor in determining whether the book can be rebound if necessary. In all but two collections, volumes bound by sewing-through-the-fold (i.e., through the folds of the signatures) outnumber those bound by any other method. Volumes that are sewn through the folds not only open easily, but can usually be rebound provided the paper is still flexible. In the Mathematics Library and the Periodical stacks, oversewing and cleat sewing were more common. Both methods require trimming away the folds and some of the inner margin and can make it impossible to rebind a volume successfully. The percentage of adhesive-bound volumes in collections with large holdings of new books proved the current popularity of this binding method. The Social Science Library had the highest percentage of adhesive-bound volumes (27.6 percent). Stab sewing, a method long used in pamphlet binding at Yale, was also widespread—ranging from 1.5 percent to 21.3 percent in the various collections, with a median of 5.7 percent.

What Is the Width of the Gutter Margin?

The width of the gutter margin was examined in order to estimate the percentage of books that could not be rebound readily by commercial methods, regardless of paper quality. A small strip of heavy paper was marked with a one-centimeter line and used to measure the narrowest inner margin in the book. (One centimeter was judged to be the minimum width required to rebind a volume easily. When margins are narrower, special care must be taken either to retain the original sewing structure, and thus all of the margin, or to trim and bind the pages with great care so as not to obscure text. Sometimes neither method is possible.) The highest percentage of books with margins less than one centimeter wide was found in the Mathematics Library (37.6 percent). Between 34.2 percent and 37.5 percent of the books sampled in the Social Science and Geology libraries and in the Periodical stack collection had very narrow margins. These statistics suggest that when bindings fail, reproduction and replacement of materials will in many cases be the only available options.

The last column in figure 3 is a statistical description on the entire sample for the target population of five million volumes. The percentages were derived by weighting the results from the various strata based on their proportion of the whole and adding these results together. It should be remembered, however, that these systemwide statistics must be used with caution because they do not describe a coherent collection. Yale's library units are very different from one another, and the statistics gathered in each are probably best understood as separate studies.

INTERSECTIONS

Some of the most useful statistics resulted from determining the percentage of books that exhibited two or more of the characteristics isolated in the survey (e.g., how many books had *both* broken bindings and paper covers). The results of many of the most important intersections are given in figure 4. Only statistics for the main research collection are given here due to space limitations. These results are shown in a mileage table format where the figures are read from both the horizontal and the vertical axes. For instance in the first column, 66.7 percent of the books did not need treatment and had rigid bindings, 4.9 percent did not need treatment and had limp bindings, and 11.2 percent did not need treatment and had acidic pamphlet bindings; 8.4 percent *did* need treatment and had rigid bindings, 2.6 percent needed treatment and had limp bindings, and 1.6 percent needed treatment and had acidic pamphlet bindings. The figures for any given intersection may not add up to 100 percent since findings were purposefully omitted when a category (e.g., vellum joint coverings) made up less than 2 percent of the sample and when data were missing because of human error (e.g., the surveyor skipped a question).

All of the intersections that were analyzed proved interesting. Some of the more significant ones are discussed here. Not surprisingly, it was found that acidity and brittleness were directly related; although approximately 80 percent of the nonbrittle books were acidic, more than 99 percent of the brittle books were acidic. Similarly, while only 6 percent of the nonbrittle books needed treatment, more than 20 percent of the brittle books needed treatment. This latter group of books (around 285,000 when extrapolated to the entire Sterling collection) will probably need replacement or reproduction, rather than repair; the books that need treatment but are not brittle can probably be repaired or rebound. An estimated 592,000 volumes, or 18.8 percent of the sample, were brittle *and* had been oversewn, cleat sewn, or stab sewn. These volumes are particularly vulnerable to damage; even gentle use could easily result in broken pages. At the time of the survey, however, the leaf attachments in oversewn and cleat-sewn volumes were generally intact; only 2 percent of those sampled were broken. This contrasts with the other leaf-attachment types, where more than 5 percent were broken. Limp bindings were more prone to failure than other forms; 33.3 percent of all limp bindings were not intact, while 4.8 percent of rigid and 7.8 percent of acidic pamphlet bindings were not intact (around 49,000 of the total number of acidic pamphlet binders in Sterling

Library: Sterling Memorial Sample size: 17,096 Size of target population: 3.1 million

	Treatment Needed		Leaf Attachment		Gutter Margin		Primary Protection		pH		Brittle		
	No	Yes	Intact	Not intact	1 cm or over	Less than 1 cm	Intact	Not intact	Above 5.4	Below 5.4	Does not break	Breaks 4 folds	Breaks 2 folds
pH													
pH above 5.4					6.3	1.9					7.9	0.2	0.2
pH below 5.4					68.2	18.7					42.7	8.3	35.6
Primary protection type													
Rigid	66.7	8.4					71.5	3.6					
Limp	4.9	2.6					5.0	2.5					
Acidic pamphlet	11.2	1.6					11.8	1.0					
Joint covering													
Cloth	67.5	7.6											
Paper	7.0	2.8											
Leather	4.9	2.0											
Leaf attachment type													
Sewn-through-fold			48.4	3.1							25.0	4.8	20.6
Over/cleat sewn			21.9	0.5							11.1	2.3	8.9
Stab sewn			17.0	0.7							9.9	1.6	6.0
Adhesive			4.7	0.1							4.4	0.1	0.2
Brittle													
Does not break	47.7	3.0			39.2	11.5			7.9	42.7			
Breaks at 4 folds	7.5	1.2			6.9	1.9			0.2	8.3			
Breaks at 2 folds	27.9	8.0			28.6	7.2			0.2	35.6			

FIGURE 4
Significant Intersections for Questions in Sterling Library

needed immediate replacement). There was also a relationship between binding type and need of attention; while 11.2 percent of the rigid bindings and 12.5 percent of the acidic pamphlets needed attention, 37.4 percent of the limp bindings needed attention. It should be noted, however, that the rigid ones needing attention formed the largest group in absolute terms (about 260,000 needing attention). A relationship between joint covering and need of treatment was also evident; only 10.1 percent of the books with cloth-covered joints required treatment, while 28.6 percent of volumes with paper-covered joints and 29 percent of volumes with leather-covered joints were in need of immediate treatment.

Figure 5 shows the percentage of books sampled in the Sterling Library that were brittle (paper broke after two or four folds), broken down by date and by country of publication. Statistics from three geographic areas are plotted: the United States, Great Britain and Ireland, and Germany. The results were surprising in that papers older than expected are now embrittled. Paper from the early 1800s through the 1950s is now brittle, with the peak extending from 1860 to 1930. The sharp decline in brittleness by the end of the 1950s is probably not due to a major improvement in paper quality since high levels of acidity continue to be found, but because flexibility has not yet been lost.

ENVIRONMENTAL DATA

During the grant period, five hygrothermographs were placed throughout the library system to document environmental

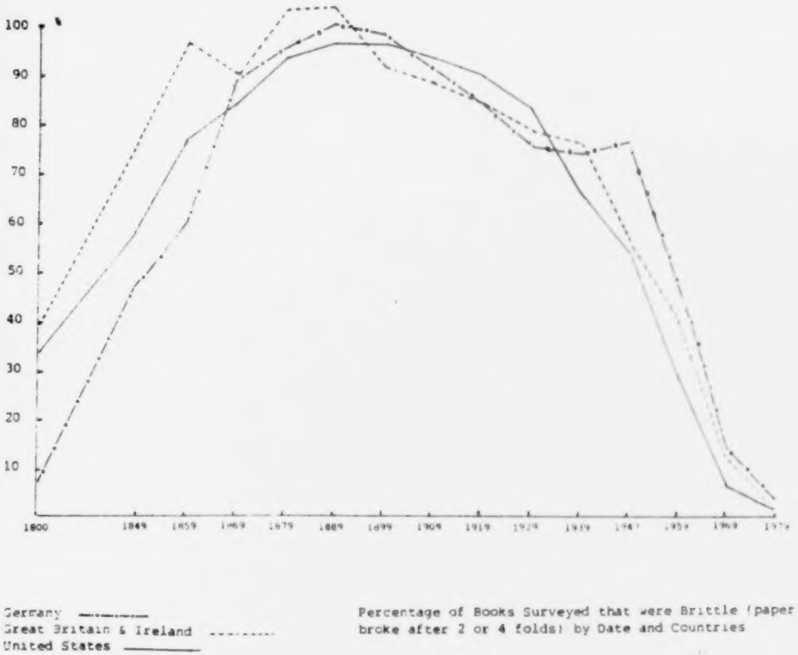

FIGURE 5
Percentage of Books Surveyed that Were Brittle
(Paper Broke after Two or Four Folds) by Date and Countries

conditions. These instruments continuously recorded (onto paper charts) levels of temperature and relative humidity. The hygrothermographs were moved at least once a year so that as many sites as possible could be monitored, but they were left in place at each site long enough to record seasonal extremes. Findings from one site (the top floor of the Sterling stacks) is shown in figure 6. Rapid fluctuations in climate, and a significant deviation from ideal conditions, is apparent. Because of the established link between air pollution and deterioration of paper and other library materials, the U.S. Environmental Protection Agency, Connecticut Air Quality Monitoring Division, was approached regarding pollution in New Haven. It is an urban area and has a bad problem, and though Connecticut is presently (1984) meeting the annual federal standards, for instance, for both sulfur dioxide and nitrous oxide, these pollutants tend to be concentrated in the city streets, including those surrounding the various library units, and there are still many days during the year when levels of pollutants are so high as to be "unhealthful," a category that does not meet federal health standards.

In addition to the monitoring program and communication with the EPA, one group of NEH interns conducted in-depth environmental studies of each of the fifteen library units surveyed. Using information gathered during site visits and discussions with unit heads, they developed detailed descriptions of each unit and proposed solutions to problems. Although the climate in the five air-conditioned units (the Cross Campus, Engineering, Geology, Kline Science, and Social Science libraries) was fairly good, in general the environment both inside and outside the library buildings at Yale was found to be inhospitable to the storage of library materials.

CONCLUSIONS

The results of the Yale survey provide a detailed description of each of the surveyed collections. This profile includes

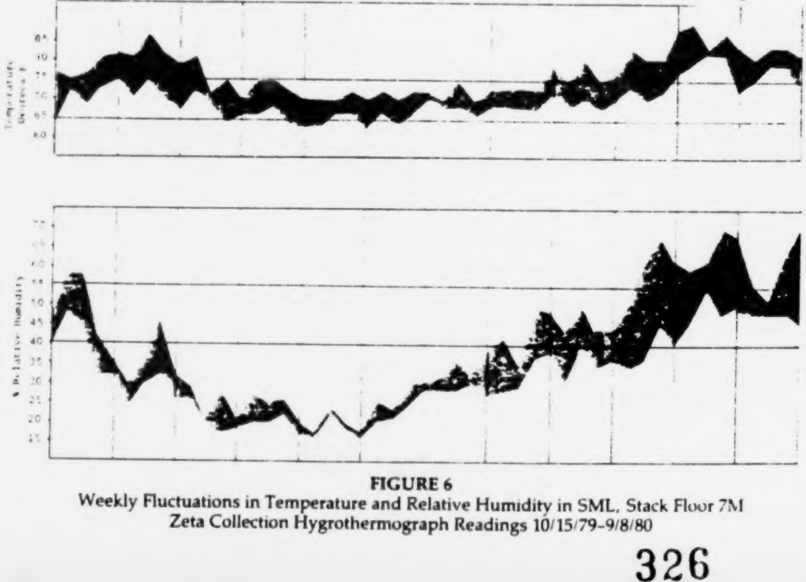

FIGURE 6
Weekly Fluctuations in Temperature and Relative Humidity in SML, Stack Floor 7M
Zeta Collection Hygrothermograph Readings 10/15/79–9/8/80

the physical condition of each unit's holdings (e.g., the number of volumes requiring immediate treatment) and an analysis of the physical composition (e.g., the number of volumes bound in paper) and publishing history (e.g., the number of volumes published in the United States during the 1890s) of each collection. The data are of practical interest to local planners and of more theoretical interest to selection officers, administrators, and students of book publishing and collecting. The amount of statistical information available from such a large survey is tremendous, and other analyses in both areas of physical condition and collection description may be carried out in the future.

A large survey that details the collection's composition and preservation problems is a powerful planning tool. This study documents the preservation needs of the Yale University Library system, and our present efforts must be reviewed in this new light. The survey was large, with a sample of more than 36,500 volumes, quite accurate, and included library collections that varied widely in age, size, use, location, and environment. The overall size of the problem should influence the level of effort and funding devoted to it; budgeting increases over several years can be proposed and justified based on the hard data available from this survey. Specific library units of the fifteen surveyed have been identified as problem areas requiring either onetime projects (e.g., screening for commercial library binding candidates) or greater preservation efforts, for instance, an expanded search-and-replacement program. We can focus on those units as our program expands. We know that large numbers of items are irreparable and threatened with loss of text, and survey results support a more aggressive program—especially in increased control of the storage environment for many of the Yale collections. The most interesting results in terms of program development are the percentages of books in need of immediate treatment (12.8 percent overall), with broken bindings (8.1 percent overall), with brittle paper (37.1 percent overall), and, for future planning, with acidic paper (82.6 percent overall).

Although this survey does not take the place of a local preservation survey that identifies environmental problems or specific candidates for treatment, it may be useful in estimating levels of deterioration at other libraries. The fact that many units of varying natures were surveyed as separate strata should allow libraries elsewhere with similar collections to identify results relevant to their own situations for local planning.

Furthermore, the survey design, the questions, and the implementation procedures described here may be particularly useful as working tools adaptable to different situations and needs at other libraries. The survey methodology was based on random sampling techniques; and the use of mapping, a presampling strategy, tagging, machine-readable forms, consistent surveyor training, and computer analysis increased the accuracy and efficacy of the actual surveying process.

For many years the preservation field has cherished those few statistics that attempt to set the parameters of the preservation problem. Many of these figures are based on educated guesses or small surveys combined with experience and common sense. For instance, the commonly quoted figures for both the Library of Congress and the New York Public Library appear in the introduction here, although both institutions are involved in new survey activities. Our rough estimate prior to the study that 30 to 40 percent of Yale's collection needed preservation attention turned out to be correct if those books needing attention include all books with brittle paper, an overestimate if it means only those books with immediate treatment problems, and conservative if it means all books with acidic paper. This large-scale survey provides one set of hard statistics in a number of different categories that presents a statistical microcosm of the various preservation problems and a sobering picture of book deterioration in a large research library.

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5. Gay Walker, "Preservation Efforts in Larger U.S. Academic Libraries," *College and Research Libraries* 36:39–44 (Jan. 1975).
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APPENDIX A: SAMPLING METHODOLOGY AND PROCEDURES

Two statisticians from the Yale Statistics Department served as consultants for the project. They helped to plan and implement all aspects of the survey, carried out the pilot survey, analyzed the data, and wrote the statistical narration. Since time and monetary constraints made it impossible to examine every volume in the Yale system, a random sample representative of the entire collection was constructed. (For a simple random sample, every volume in the target population must have an equal chance of being selected for sampling.)

The basic principles of sampling within the library framework have already been treated in the literature.[*] However, the structure of the sample needed to examine the books in a large academic library is more complicated than those of the surveys previously conducted. Although the Yale survey, like others, used a random sampling technique, the sampling also took into account particular attributes of each library unit being studied. A stratified sampling design[†] was used whereby the entire library system was divided into strata. Each departmental and area library comprised a different stratum, and reference and reading rooms were often broken away from the main collections because of their peculiar characteristics. The Sterling Memorial Library was subdivided so that each floor, and several of the special units (the Periodical stacks, the Main Reading Room, and the Preservation Division), were studied as separate strata. Thus, the location, environment, reader access, and general level of maintenance within strata were similar, while the characteristics of one stratum could be quite different from those of another.

In order to sample the collections in these strata randomly, a sampling frame was built. A sampling frame is a systematic, usually hierarchical method for giving each member of a target population a unique label, the label usually being a number or a series of numbers.[‡] Our sampling frame was based on floor plans of each stratum showing all stack ranges and the number of sections in each range. Random numbers based on these plans were generated by computer. Each nine-digit code identified a particular book by stratum (two digits), range number (two digits), section number (two digits), shelf number (one digit), and book number (2 digits). All random numbers were sorted in hierarchical order so that the surveyor could move in a logical progression through a given stack area.

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[*] See, for example, M. Carl Drott, "Random Sampling, a Tool for Library Research," *College & Research Libraries* 30:119–25 (Mar. 1969); also, Marianne Goldstein and Joseph Sedransk, "Using a Sample Technique to Describe Characteristics of a Collection," *College & Research Libraries* 38:195–202 (May 1977).

[†] See, for example, W. G. Cochran, *Sampling Techniques*, 3d ed. (New York: Wiley, 1977), p.89–146.

[‡] A good primer on sampling concepts and terminology is F. J. Anscombe's "Some Principles of Sampling," unpublished manuscript, 1975.

The numbers identifying ranges, sections, and shelves had identifiable maximums based on stack configurations. For example, stratum fourteen may have had forty ranges with no more than twelve sections per range, each section having no more than seven shelves. The number of books on a shelf, however, tended to vary from 0 to as high as 150 in some cases. For reasons of efficiency, an artificial book-per-shelf maximum of 30 was chosen. This was found to be usually as large as, or larger than, the average number of books per shelf in each stratum. The computer-generated random numbers corresponding to book position, then, went no higher than 30. Mapping (i.e., annotating floor plans so that empty ranges and sections were not included in the sampling frame) was used to make the sampling procedure more efficient. So that books with shelf positions exceeding 30 were allowed to enter the sample, a tagging procedure was devised. The sample that resulted from this design was an approximate simple random sample of the target population.

If the random numbers designating book positions went up to, say, 150, the frame would have encompassed the entire target population and resulted in an exact simple random sample of the target population. However, it also would have enlarged the sampling frame to such a degree that the hit rate would have been drastically lowered. That is, only rarely would one find books in the positions identified by the higher random numbers designating book positions, since most shelves contained thirty or fewer items. The enlarged sampling frame would also increase the surveyors' work load and introduce more opportunity for errors.

Tagging (i.e., systematic subsampling) worked in this way: every time a book was sampled, the thirtieth book on the same shelf beyond the one identified by the random number was also sampled (if it existed). For instance, if the book identified by the computer printout was the seventh from the left-hand edge of the shelf, the thirty-seventh, sixty-seventh, and ninety-seventh books were also sampled if present. This procedure ensured that unusually full shelves were not undersampled. We tried to keep the proportion of tagged books in the sample at 10 percent or less as a safeguard against any possible "long-shelf" effects. In some subunits we could do this by adjusting the book-per-shelf limit to a more appropriate value for that unit. Tagged books were identified as such on survey forms in order to track percentages.

Once the frame was completed, we needed to determine the required sample size and how many random numbers to generate. In this survey, the chosen sample size was a function of the desired accuracy. In a simple dichotomous situation, for example when determining the percentage of books with an intact text, the standard error associated with the sample proportion of books with intact text is no greater than $1/(2\sqrt{n})$, where n is sample size, and we can ignore the finite population correction (fpc).* Hence, a sample of size 1,600 would give us an estimate of the proportion of books in the library with intact text and a standard error no greater than 1/80 or 1.25 percent. This would mean that we could be fairly confident about placing the proportion of books with intact text in an interval of the form: sample proportion ± 2.5 percent. We also needed to select enough books to analyze the condition of library holdings in terms of several variables, e.g., what proportion had brittle paper and also needed repair? In general, this necessitated taking large samples, usually between 1,000 and 2,000 books in a stratum.

Once sample size (n) was determined, we could calculate how many random numbers (k) had to be generated in order to sample the desired number of books by solving $(k)(r) = n$ (where r equals the hit rate). For example, if the sample size required was 1,600 and the hit rate was known to be 50 percent, then one would generate 3,200 numbers inside the sampling frame. Unfortunately the hit rate can only be guessed at beforehand, and it tends to vary from stratum to stratum. An underestimate of the hit rate would produce an unnecessarily large sample, while an overestimate would produce too small a sample. This problem was addressed at Yale by developing a presampling strategy. For each stratum the statisticians generated between 200 and 500 random numbers inside the respective frames. By recording whether a book was to be found at each location specified by the number, and by recording any tagged books that would result, they were able to determine the presample hit rate. This served as an estimate of the hit rate (r) that could be expected in the actual survey sample and was used in the equation $(k)(r) = n$ to determine k. Because presample hit rate is not an exact predictor of r, and because r affects the ultimate size of the sample, the actual sample sizes we observed were close but never equal to the desired sample sizes. The actual sample size usually fell within 50 to 100 books above or below the desired sample size.

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*See Cochran, *Sampling Techniques*, p.24–25.

APPENDIX B: SURVEY INSTRUCTIONS

The following instructions are a synthesis of those given to the Yale surveyors.

Supplies

Gather the following materials:
1. support jig
2. heavy paper overlay
3. supply of forms marked with code letter and date
4. #2 pencil
5. pH indicator pen
6. random number printout
7. heavy paper strip to measure gutter margin width

Finding a Book to Evaluate

A computer printout of random numbers gives the location of a book. If the random number does not locate a book, mark a zero after the number. If a book is located, check off the random number. The random numbers appear on the printout in units, e.g., 2 49 8 3 9. Each unit comprises two-digit numbers for the floor, range, section, and book and a one-digit number for the shelf. Enter the number on the form with zeros added where appropriate to look like this:

Floor or Library	0 2
Range	4 9
Section	0 8
Shelf	3
Book	0 9

Floor: The first two digits can refer to a floor or can be a number arbitrarily assigned to a specific library subunit.

Range: In some libraries, ranges are numbered, in others they are not. The floor plan used to map out the sampling frame showing the range numbers can be used.

Section: A pattern of movement must be designed for counting sections. Always start from a designated point and move around or along the range in the same direction. The pattern will, of course, change to meet specific conditions.

Shelf: Shelves are counted down from the top.

Book: Books are counted from left to right. In counting, any material tied together is counted as a unit as is material with the same call number. Dummies (boards left in place of books) are not counted.

Filling out the Form

1. Enter the random number on the form.
2. Enter the call number of the book and underline the letters s, n, o, and b to distinguish them from 5, h, zero, and 6, respectively.
3. Enter country and date of publication.
4. Answer questions 1 and 2.
5. Evaluate the book. Answer questions 3–14. For boxes and envelopes answer questions 1–3, 5, and 12–14 only.
6. Put the finished form in the pocket underneath the jig.
7. Fill in ovals for date and country at the end of the survey period.
8. All completed forms should be returned to a central location each day.

Guidelines for Answering Questions

Country: Record country of *publication* or *reprint* if given. Record *any* lack of information in the questions box. If a city is given but the country is unknown, consult an atlas and/or the shelflist.

Date: Record latest date shown or date of reprint. If no information is given, consult the shelflist. Record any lack of information in the questions box.

1. *Tagged:* Every thirtieth book *after* the first book located on a shelf is considered tagged.
2. *Circulating:* Noncirculating books are stamped "noncirculating" on the inside of the book cover or are in a special collection. Also, periodicals published within the last ten years are noncirculating.
3. *Primary protection* (outer protective covers):
   - a. *Rigid* includes rigid attached covers and limp vellum bindings.
   - b. *Limp* includes paper bindings (oriental or occidental) and attached paper covers.
   - c. *Acidic pamphlets* are all old ones with cloth tape on spine (pre-1977).
   - d. *Acid-free pamphlets* are all new ones known to be acid-free (post-1977).
   - e. *Acidic boxes and envelopes* include all old ones (pre-1977).
   - f. *Acid-free boxes and envelopes* are new and known to be acid-free (post-1977);
   - g. *None* includes unbound materials such as pamphlets without attached covers of any kind. For single units, answer all questions if possible. Although material tied together, with or without boards, is considered a unit, answer questions 1–3, 5, 12–14 only for this material.
   - h. *Other* includes rigid unattached covers such as slipcases and oriental cases.
4. *Covering of joint* (material covering outer hinge): If question 3 is "none" answer N/A.
5. *Primary protection functional:* Not functional includes inner hinge torn more than 25 percent, book block loose enough in case to extend beyond book covers, board broken, and limp binding that does not support text.
6. *Leaf attachment:*
   - a. *Sewn/stapled through the fold:* Look at head of book for rounded gatherings. Look for sewing thread or staples in gutter.
   - b. *Oversewn/cleat sewn:*
     Oversewn: Book opens only to sewing thread visible at intervals of about one-fourth of an inch; Cleat sewn: Adhesive looks like rubber bands visible at intervals of about three-fourths of an inch in gutter.
   - c. *Adhesive:* Backs of gatherings are cut off or sawn in at intervals. This can look somewhat like sewing but no threads are visible.
   - d. *Stabbed:* These usually show three to six holes. Thread or staples are at a right angle to plane of book.
   - e. *None:* Record unlinked materials here.
   - f. *Unknown:* The binding method cannot be ascertained without damaging the book.
   - g. *Other:* This includes spiral, ring binders, accordion bindings.
7. *Leaf attachment intact:* This is self-explanatory.
8. *Brittle paper:* A page is chosen toward the middle of the book, its corner folded four times, and the crease pinched on each fold. Do not test books printed before 1800. Note when the paper breaks after two folds, after four folds, and if it does not break.
9. *pH of paper:* A short line of indicator fluid is drawn in an inner margin. If it turns blue within thirty seconds, the paper has a pH of 5.4 or above. If the mark is not blue (blue-green, green, yellow), the paper has a pH of less than 5.4.
10. *Gutter margin width:* Record narrowest margin visible in brief inspection as less than 1 cm. or as 1 cm. or greater. Use the 1 cm. marked tag to measure where necessary.
11. *Text intact:* Not intact includes tears into text, pages entirely detached, pages missing, and parts of pages missing. Do not include torn blank leaves as not intact.
12. *Mutilation:* Thumb quickly through the text to find leaves cut out, underlining, Scotch tape, food stains, or obvious evidence of mutilation by people, animals, or machines.
13. *Environmental damage:* At the same time look for fading, mold, pest damage, water stains, or charring.
14. *Immediate treatment needed:* Treatment is needed if the primary protection is *not* functional (#5 = No), the leaf attachment is *not* intact (#7 = No), or the text is *not* intact (#11 = No). Do not record cosmetic damage, such as torn headcaps, frayed corners, or loose labels, as needing immediate treatment.

APPENDIX C: ABBREVIATIONS FOR FREQUENTLY USED COUNTRIES OF PUBLICATION

ARGE	Argentina
AUSL	Australia
AUST	Austria
BELG	Belgium
BOLV	Bolivia
BRZL	Brazil
BULG	Bulgaria
CANA	Canada
CHIL	Chile
CHNA	China (People's Republic)
TAIW	China (Nationalist)
CLMB	Colombia
CSTR	Costa Rica
CUBA	Cuba
CZEC	Czechoslovakia
DENM	Denmark
DOMR	Dominican Republic
ECUA	Ecuador
ENGL	England
FINL	Finland
FRAN	France
GERM	Germany
GREC	Greece
GUAT	Guatemala
HOND	Honduras
HUNG	Hungary
IREL	Ireland
ISRL	Israel
ITAL	Italy
JAPN	Japan
LUXG	Luxembourg
MEXI	Mexico
NETH	Netherlands
NWZL	New Zealand
NICA	Nicaragua
NIRE	Northern Ireland
NORW	Norway
PAKI	Pakistan
PANA	Panama
PRGY	Paraguay
PERU	Peru
PHIL	Philippines
PORT	Portugal
SCOT	Scotland
SAFR	South Africa
SPAN	Spain
SWDN	Sweden
SWTZ	Switzerland
TAIW	Taiwan
USSR	Russia
USAM	United States
VNZL	Venezuela

APPENDIX D: STATISTICAL ANALYSIS

The data recorded on the survey forms were scanned electronically and transferred to magnetic tapes. Prior to analysis, the data were cleaned and reordered onto master volumes. From the total target population of five million volumes, more than 36,500 records were gathered from libraries throughout the university. Each record contained information about a single book, including answers to the fourteen preservation-related questions, and five other pieces of information: the place and date of publication, a code identifying the surveyor who evaluated the book, the random number used to locate the book, and the call number. Call numbers were recorded so that the condition of any item could be checked again at a later date.

Our main software tool was the package Table Producing Language (TPL), version 4.0, developed at the Bureau of Labor Statistics, U.S. Department of Labor. TPL is designed for efficient construction of tables from large data sets.

For each of the thirty-six strata, straight tabulations were run that gave raw counts of the number of books that fell into each category for each of the fourteen main questions. Attaching standard errors to these allowed us to produce confidence intervals for the proportions of books in each stratum with the characteristics of interest, e.g., condition of text, embrittlement, mutilation, etc. In all cases where a large unit was broken into subunits for analysis, the data gathered were weighted and grouped together for presentation in the tables reproduced in this paper. We also produced most of the possible two-way tabulations, e.g., the numbers of books that had both brittle paper and a broken binding.

In addition, frequency tables were produced for the date and place of publication of the books surveyed in each stratum. Information about books published in small geographic units was grouped together within larger geographic areas so that sample sizes would be large enough to give reliable results. Dates were grouped into one period from 1801 to 1850, and thereafter by decades. Such batching made it possible to compare critical variables, e.g., embrittlement, across time and place.

In order to estimate the precision of the data gathered, the standard error was calculated for all survey results. Standard error is a measure of the accuracy to be expected in making statistical estimates, and is calculated thus:

$$SE(\bar{X}) = \sqrt{p(1-p)/n}$$

where $\bar{X}$ is the sample proportion with characteristic X, p is the population proportion with characteristic X, and n is the sample size. Hence, the standard error of $\bar{X}$ decreases as $\sqrt{n}$ increases. Increasing the sample size by a factor of four will halve the standard error of $\bar{X}$. For example, a sample size of 900 will give a standard error for $\bar{X}$ of

$$\sqrt{p(1-p)}/30$$

which is less than or equal to 1/60 or about 1.67 percent. A more realistic standard error is

$$\sqrt{\bar{X}(1-\bar{X})/n},$$

where $\bar{X}$ is used to estimate p.

Another essential factor in interpreting the survey results was establishing the confidence interval, i.e., our estimate for p and a range for the estimate. The formula for determining the confidence interval is:

$$\bar{X} \pm (z)(\text{standard error of } \bar{X}),^{*}$$

where $\bar{X}$ is the sample porportion with characteristic X and can be approximated as a normal variate, and z is the appropriate critical value for a normal. A 99 percent confidence interval would be interpreted as follows: if this study were repeated under the same conditions many times and if confidence intervals were constructed in this way each time, 99 percent of the intervals should contain the true value of p, the unknown proportion of books in the population with characteristic X. All results given here are based on a 99 percent confidence interval.

In the Sterling Memorial Library, stratification by floor yielded a wealth of information. The results from each floor were weighted according to the size of that floor in relation to the whole. To obtain an overall summary, we aggregated the weighted results from each of the fifteen floors. The resulting overall frequency estimates and associated standard errors were computed as follows:

Denote the fifteen floor weights as

$$c_1, \ldots, c_{15} \text{ where } c_1 + \ldots + c_{15} = 1.$$

Suppose the sample frequencies of characteristic X from each floor are

$$\bar{X}_1, \ldots, \bar{X}_{15}.$$

Then the overall estimate for the frequency of characteristic $\bar{X}$ in Sterling is given by:

$$\bar{X} = c_1(\bar{X}_1) + \ldots + c_{15}(\bar{X}_{15}),$$

and the standard error for $\bar{X}$ is

$$SE(\bar{X}) = \sqrt{c_1^2(\text{var}(\bar{X}_1)) + \ldots + c_{15}^2(\text{var}(\bar{X}_{15}))},$$

where var means variance.[†] A similar approach was used to produce the weighted estimates for the entire library system. These appear in the column labeled "Yale Overall" in the third table of figure *.

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[*] See W. G. Cochran, *Sampling Techniques* 3d ed. (New York: Wiley, 1977), p.27.

[†] *Ibid.*, p.92, 107–8.

Section 5: Preservation Organization and Administration

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Administration and Budget

As custodians of cultural property, research libraries have an obligation to pass on to future generations the information contained in our collections, both by maintaining books of artifactual value and by preserving the intellectual contents of books whose importance lies in their contents. An effective preservation program will be headed by a person primarily responsible for the preservation of the collections, someone with authority to work throughout the organization who has access to top management. The following are steps and considerations to be taken into account when developing such a program:

1. Surveys of the physical condition of the collection, of environmental and storage conditions, and of staff book-handling practices will be useful to establish requirements and goals for the program. Also important is an analysis of work flow and of existing procedures for materials processing. These activities should lead to formulation of a development plan that will identify short-term, medium-term and long-term objectives.

2. With the collection's preservation needs in mind, a number of units to carry out a variety of tasks may be established and/or revamped. Precise space requirements and costs for refurbishing existing areas should be established. Major programs commonly include units to handle categories such as book repair, commercial bindery preparation, preservation searching and decision making, photographic reproduction, plating and labeling, stack maintenance, and restoration.

3. It is important to choose one or more activities within the program plan for first-priority attention, so that the program may grow steadily on sound foundations. For instance, in the preservation searching and decision-making unit, procedures would be developed so that items needing attention are identified and routed to the proper area. Search and decision-making routines would then be established along with procedures for those options chosen as most important or most likely to be accomplished.

4. Communication with other units and staff within the library system is most important to the future of any new major program. Not only must other units know what is being done and be able to work with preservation requests on both administrative and procedural levels, but staff need to become aware of the preservation problem and learn how their actions affect materials during normal processing routines.

5. A formal program for the education of both staff and users will ensure that book abuse through mishandling is avoided. This undertaking may include audiovisual aids, talks and demonstrations, tours, exhibits, handouts, and posters.

6. The availability of preservation/conservation personnel to other staff members and library units for consultation is a key element.

It is important to realize that the preservation unit may also serve as a liaison with faculty, students, and the community, in general through consultation contracts.

7. Crises should be expected. Preservation staff are likely to be responsible for drawing up plans to handle water damage, fires, or other disasters. These plans should receive a high priority rating and rely heavily on the work of the person or committee responsible for preservation planning.

8. Existing insurance policies covering library collections and equipment might be reviewed with special attention paid to the nature of deductibles and limitations. It would be useful to raise the following questions: do existing policies protect library collections against theft and water damage, as well as against fire and other natural catastrophes? Is the per-book replacement coverage of the policy adequate? Are key library records (e.g., card catalogs and shelf lists) insured for their informational content as well as their physical replacement? Do rare materials have to be separately scheduled? What is the insurance protection on books and documents lent for exhibit outside the library in which they are normally housed?

Budgeting

To ensure the prudence of both long- and short-term preservation program plans, it would be helpful to make a thorough cost analysis and review it with the business manager or budget officer. Activities that have been given first priority will thus have a realistic price tag, and future sections of the plan can be worked into the budget.

It is useful to earmark all the preservation expenses including staff, equipment, materials, replacements, and binding budgets so that costs can be documented and serve as a base for future budgeting. Extra expenses involved with a new preservation program may be more realistically built into the budget in this way.

The library administration is the most important element in the planning of preservation programs. Cooperation and support from the front office translates into a successful program.

Association of Research Libraries
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GUIDELINES FOR MINIMUM PRESERVATION EFFORTS IN ARL LIBRARIES

[Approved by the ARL Membership on October 25, 1984*]

Since physical deterioration of research library collections is a well known matter of particular concern, ARL has adopted as its third principal objective in its 1983 five year plan: "To increase the number of member libraries engaged in programs to preserve their collections." That document acknowledges that individual research libraries bear responsibility for preserving their collections as part of the collective resources of the research libraries of North America. ARL efforts to achieve this objective will be aimed at helping libraries meet this local responsibility. ARL should provide leadership and, to assist in this important task, guidelines are needed to suggest an appropriate minimum preservation effort that each research library should seek to attain.

"Preservation" is here meant to be broadly inclusive of efforts to maintain collections that are intended for use by future generations. This obligation of our present generation needs to be expressed in a set of activities that provides appropriate protection and some assurance of the continued availability of those materials that are now in, or are being added to, research library collections.

"Minimum" is here used to mean a desirable and presumably practical level of moderate strength to which all ARL libraries should aspire in the course of this decade. Once attained, it is a level which should be able to be maintained over the long term. It is well below an optimum level, and indeed it is far below what the more ambitious libraries with good financial support can attain. It is hoped that this minimum level is one which by 1988 at least half of the ARL membership could attain or exceed; and by the end of this decade all ARL libraries could have attained or exceeded.

The elements of a minimum effort are diverse. There are few activities in a research library that do not in one fashion or another affect the longevity of materials. A comprehensive preservation effort certainly includes attention to the atmospheric environment in which the materials are housed and used. It could include the training methods used for staff handling of materials, the photocopy operations, the acid content of bookplates, the quality of bookstack shelving, the ultraviolet filtration of fluorescent tubes, and even the very nature of the materials that are selected for addition to the collections. (See Attachment 1 for an attempted statement of responsibility by one organization.)

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* The ARL membership voted to approve the Guidelines with the understanding that further clarification would be forthcoming on the gathering and reporting of preservation statistics. With the assistance of the Committee on ARL Statistics, the ARL Committee on Preservation of Research Library Materials has revised the statistics portion of the Guidelines and, based on this revision, has prepared and distributed an experimental 1984/85 ARL Preservation Statistics Questionnaire.

Recognizing that there is an almost infinite set of conditions that could be included in guidelines for minimum preservation efforts, ARL has chosen five aspects that seem possible of attainment by its membership. Taken together they should constitute a good base of minimum effort.

1) Local program statement: Every library should have a document defining its preservation goals and objectives together with a statement of current and prospective preservation activities. Such a document should at the least include a description of the various preservation program elements that currently exist in the library and should outline those that it will seek to provide within a short period of years. The document would not detail the specifics of the program. Rather it constitutes a general program statement that would convey to its staff, organizational officers and trustees, and to other ARL members a clear sense of the content of the program, the direction that is intended by the library administration, and the strength and emphasis with which it is to be pursued.

2) Statistics: There should be compiled regularly a set of statistics that will document the annual preservation activity and present over a period of time a picture of the change in activity. Such data at the least should include:

- FTE staff assigned to the preservation activity;
- preservation expenditures;
- proportion of preservation expenditures coming from regular library budget;
- number of items given full conservation treatment, given routine conservation treatment, and given protective enclosures;
- number of volumes given contract binding;
- number of volumes given mass deacidification;
- number of reels of preservation microfilms and sheets of preservation microfiche produced;
- number of reels of preservation microfilms and sheets of preservation microfiche held.

(Comment: Only some preservation activities are amenable to statistics collection. Exactly which statistics can and should be collected is not yet known. The statistics listed above appear on the experimental 1984/85 ARL Preservation Statistics Questionnaire, mailed to ARL libraries on June 28, 1985. Based on the outcome of this test, ARL may revise future versions of these Guidelines.)

3) National participation: All current efforts to film or otherwise copy for preservation purposes should be part of a coordinated national effort and consequently there should be three correlative activities. First, before making a decision to film, a careful search must be made for an existing archival master negative that can be copied. Second, there should be adherence to archival standards in the production, storage, and use of master microfilm negatives whenever they are made. And third, the

records for those master microfilm negatives should be contributed to the National Union Catalog or the comparable listing of newspapers, and/or should be contributed to at least one major bibliographic utility in order to ensure online availability of bibliographic records for preservation copies of films.

4) Environmental conditions: Materials in all collections that are unique in the library, and those for which a primary collection responsibility as part of a national collection coordinated effort has been assumed, should be housed in an environment that is filtered and air conditioned so as to temper the natural extremes of temperature and humidity. While this minimum does not specify the mechanical requirements of the air conditioning system, it is presumed that the minimum is at least a system which has cooling, humidity control and particulate filtration. Optimum conditions and archival standard conditions would of course be much more rigorous, requiring closed stacks, limited access to certain materials, and other protective measures, but these are not mandated at the minimum level.

5) Current budgetary effort: The library should allocate to measurable preservation activities an amount equal to at least 10% of its expenditures for books, serials, and other library materials or 4% of its total expenditures. Total expenditures and expenditures for books, serials, and other library materials are requested in the regular ARL Statistics Questionnaire and published in ARL Statistics. Measurable preservation activities are defined as those for which statistics are collected in the 1984/85 ARL Preservation Statistics Questionnaire. This questionnaire requests data on the salaries and wages, contract expenditures, and expenditures for supplies and equipment that have been spent on the following activities: full and routine conservation treatment, protective enclosure, contract binding, mass deacidification, and preservation microfilming.

Whereas some academic and research libraries currently spend for preservation activities, as defined above, from 1% to as much as 21% of their current operating budgets, only those programs in the range above 4% of expenditures can be said to be moderately strong and emerging into maturity. While this 4% figure is a subjective judgement, it is like any service standard that is meant to provide a rough characterization of what may be relatively strong and vigorous, yet in need of improvement and possibly less than the institution can achieve with some additional effort. This has to be an approximation in many libraries due to the fact that local accounting may not facilitate aggregation of expenses for preservation as defined.

The exact allocation of the preservation budgetary resources to various activities is a matter that can only be resolved locally. Thus, no attempt is made to suggest the apportionment except to call attention to the illustrative activities in the above definition of preservation.

(Comment: This 4% is a guess as to what magnitude of program may achieve equilibrium—as much progress made in preservation as will offset the rate of deterioration over the long haul. Indeed, further experience in the extent of preservation effort needed in order to begin to break even on the rate of deterioration may well suggest that 10% or even more may be necessary as a minimum. Research libraries with an exceptionally high proportion of manuscripts on poor paper or printed materials from the period with the worst paper may in fact have to expend what to others may seem an exorbitant proportion of their operating funds on preservation if they intend to achieve equilibrium. There could therefore be an optimum level of support, which may at individual libraries be several times the minimum level suggested above. And it should be no surprise, and certainly imply no managerial criticism, if a majority of ARL libraries today fail to exceed the minimum. Especially when dollars are scarce, priorities must be set for what can and cannot be achieved. It is probably the case that every library feels that it is inadequately coping with preservation deficiencies.)

These Guidelines were prepared in the light of informed opinion in 1983; the statistics components were revised in the spring of 1985. The state of technical and scientific knowledge about the nature and rate of deterioration of library materials, and of methods for their stabilization or strengthening, is still primitive enough that the current generation cannot with certainty say what should be a minimum preservation effort or an optimum preservation effort over the long term. As a consequence, these Guidelines will be reviewed by ARL every three years. Additions and modifications are to be expected as experience casts additional light on the topic. It is intended that these Guidelines serve as an encouragement, as a benchmark for individual effort, and not that they be used for accreditation purposes. The field of preservation is too uncertain to warrant such a rigid approach.

On the other hand, the extent of deteriorated collections is now of such overwhelming magnitude that the current generation must set some goals and strive mightily to achieve these if in fact we are to guard against leaving for our successors a literally impossible task. On that basis, ARL believes that these Guidelines for minimum preservation efforts provide a step in the right direction, and they are commended to ARL members for individual application. The aggregate result of our efforts should serve to strengthen the research capacities of our libraries for the years ahead. This is our obligation to future generations of scholars.

ARL Committee on Preservation
of Research Library Materials

Harold W. Billings
Margaret S. Child, Council on
Library Resources Liaison
John Laucus
Peter Sparks, Library of Congress
Liaison
David H. Stam
David C. Weber
Margaret Otto, Chair

Revised July 1985

0500F

Attachment 1

Minimum Preservation Obligations for RLG Members in Areas of Primary Collecting Responsibility

Member libraries should recognize special obligations to maintain and preserve their collections in areas of primary collecting responsibility (as defined by the Collection Management and Development Committee) and to enhance preservation of these materials as resources permit. These in-depth subject collections not only serve the holding library and its patrons but are also a resource for the whole of the Research Libraries Group and the larger population of scholars and researchers nationwide. Such collections should be maintained in good condition in hard copy or microform to allow the researcher continued access.

Material is considered to be in good condition if it can be subjected to normal use, now and into the foreseeable future, without incurring noticeable damage. Publications on paper are not in good condition if the paper is so brittle that it will crack or break when handled or photocopied, if it cannot be bound or rebound, or if it is highly acidic (for example, groundwood paper such as newsprint) and therefore likely to become brittle within a few years. Bound volumes are not in good condition if the internal binding structure is broken, or if covers are not intact. Publications on a film base (microforms, slides, etc.) are not in good condition if the film is torn, stained, scratched, or otherwise degraded to the point that it cannot be read on proper viewing equipment, or if the film housing (reel, slide mount) is damaged. Mutilated volumes are by definition not in good condition, and priority should be given to replacing missing or mutilated portions of library materials.

If volumes are not in good condition, they may be repaired, rebound, or restored where possible, if this is adequate to maintain the title in good condition. If not, the library may acquire a reprint or microform replacement if available. If this is not possible, the item may be filmed or reproduced in an archival hard-copy format.

Approved by the RLG Preservation Committee, October 15, 1981.
Approved by the RLG Collection Management and Development Committee,
January 21, 1983.

National Archives and Records Service
20-year preservation plan

(1984)

General statement

The mission of the National Archives is to care for the important documents produced by the Federal government, to make them available for research, and to pass them on to the next generation. Preservation is a paramount concern. The principle issues we face are two: the enormous volume of documents that we hold and the natural physical deterioration that takes place as records age and are used.

Magnitude of the problem

The raw numbers of our holdings show the dimensions of our problems: 3 billion pages of paper, 5 million still photographs, 9.7 million aerial photographs, 1.6 million maps, 91 million feet of motion pictures, 122,000 sound recordings, and a growing body of computer tapes. An extensive survey by NBS recently completed in our textual records helps us identify the types of documents in most serious need of preservation. We know, for example, that ten percent of the bound records have preservation problems, that eight percent of the files are made of nonpermanent paper and processes, and that sixteen percent of the paper is folded, a condition that causes serious deterioration along the fold lines.

Development of the 20 year plan

Following the survey, the National Archives developed a 20-year preservation plan for textual records. The plan focuses on continuing conservation of the bulk of materials through basic environmental and storage controls. The National Archives has embarked on a systematic reconstruction of the heating, ventilating, and air-conditioning systems in the National Archives Building, aimed at providing a better, more stable environment for historic documents.

Plan of action

Building on that solid environmental foundation, the preservation plan establishes four major areas for action:

1. Perform holdings maintenance systematically. Documents will have an appreciably longer life if they are unfolded, housed in acid-free folders and boxes, and are properly shelved. The preservation plan stresses eliminating these problems in new records as they arrive, a system of preventive maintenance. At the same time staff members will unfold, refolder, rebox, relabel, and reshelve records already in our custody.

2. Intercept and assess documents at time of use. The most frequently used doucments are in the most danger of damage and the most likely to require preservation work. The preservation plan requires National Archives personnel to

examine the condition and orderliness of materials at time of use; to copy, cover, or otherwise protect requested documents that could potentially be damaged during use; and to withhold from immediate use any records that might be severely damaged by further handling and that cannot be easily copied or adequately protected. At the same time, the archivists will create a machine-readable database on the preservation needs of the records in use.

3. Systematically duplicate rapidly deteriorating copies.

Stencil-mimeograph, thermofax, verifax, and other reproductions produced during the 1930's, 1940's, and 1950's are rapidly losing the contrast between the paper and ink, making the image ever fainter. At present no technology is available to reverse this fading process, and corrective action must be taken promptly. Where a large concentration of such copies are known to exist, copying work will proceed immediately. As other records with these deteriorated copies are intercepted prior to reference service, the fading items will be recopied.

4. Conserve national treasures and records of intrinsic value.

Approximately 900 cubic feet of records in the National Archives are informally known as "treasures," including the records of the Continental Congress, the treaties of the United States, and other seminal documents of our national heritage. Additional records, representing about one fourth of the total holdings, are said to have intrinsic value, which means that they must be preserved in their original physical format. A plan and schedule for conserving the "treasures" was developed in 1981 and is in operation. As records with intrinsic value are requested for use, they will be reviewed and if there are preservation problems they will be given priority treatment in the conservation laboratory. The most frequent treatment is deacidification and encapsulation of the document.

While the focus of preservation efforts during the next 20-years will be on the textual holdings, the preservation of nontextual holdings will continue. In the recent past most of the preservation effort has been directed to nontextual materials, in particular motion picture film and still photographs, and most critical work is completed. The major preservation method of nontextual records is copying, either by replacement of the originals with the copy or by retirement of the original to secure storage while the copy is used by researchers.

Resources

Preservation is expensive. Even basing our preservation plan on a system of preventive maintenance, overcoming the backlog while conserving all newly accessioned material, means that an increase in preservation funds is essential. The National Archives projects that 20-years will be required to stabilize the holdings and to make the preservaiton program fully current. During this 20-year period approximately half of the resources will be directed toward working through the backlog of documents in need of preservation and half will be used to conserve new accessions. The charts and tables that follow summarize the annual outlays required beginning in fiscal year 1986 and are contained in the budget being forwarded to the Office of Management and Budget. During fiscal year 1984 and 1985 we estimate we will spend approximately $4.4 million and $5.585 million respectively on basic preservation.

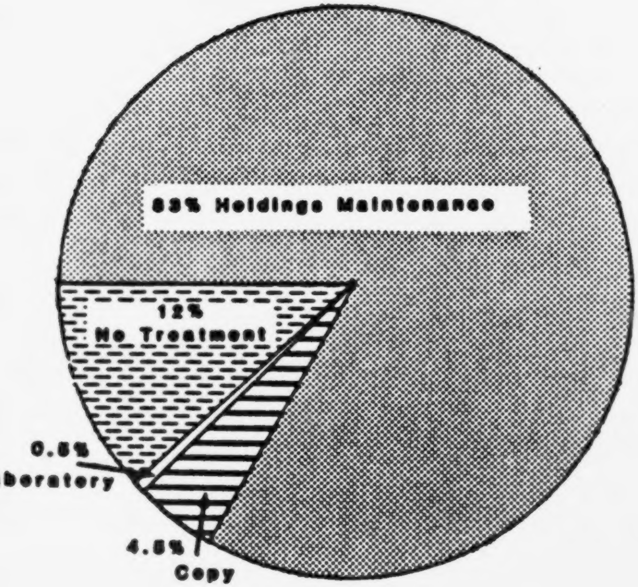
Commitment

The preservation plan is a measure of the National Archives' commitment to care for the historic treasures it holds in trust. Records do decay, and the longer preservation is postponed the more costly it becomes. Funding the plan is a statement of national accountability for preserving our past to benefit our future.

National Archives and Records Service

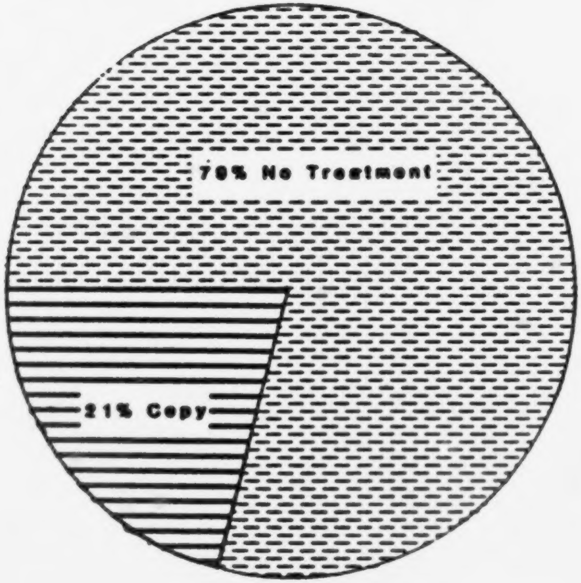
Preservation Required

Textual Records



3 Billion Pages of Paper

Nontextual Records



5.0 Million Still Photographs
9.7 Million Aerial Photographs
1.6 Million Maps
91 Million Feet Motion Pictures
122,000 Sound Recordings
Plus Growing Body Of Computer Tape

National Archives and Records Service

20-YEAR PRESERVATION PLAN

1986 - 2005

Textual	Average annual expenditure by function	Average annual staff years by function
Holdings maintenance	$2,266,850	79
Copy	2,345,050	49
Laboratory	2,736,300	49
Research	1,071,550	4
Nontextual		
Copy	2,692,250	17
AVERAGE ANNUAL TOTALS	$11,112,000	198

Excerpts from Morrow, Carolyn Clark. A CONSERVATION POLICY STATEMENT FOR RESEARCH LIBRARIES. Occasional Papers 139. Urbana, University of Illinois Graduate School of Library Science, 1979. pp.2-7, 15-18.

ABSTRACT

Despite the fact that methods are available to combat the conservation problems facing research libraries, many libraries have not acted. Part of this inaction can be attributed to the complexities of the problem and inadequacies of present technology, but a larger share of the blame must be aimed at the lack of a philosophical framework for conservation. This paper serves as a "mock" policy statement designed to provide logical guidelines and outline optimum conditions for the conservation of a research library collection. Individual libraries may modify it to their own particular situations. The policy statement includes principles of conservation and elements of a comprehensive conservation program, such as collection maintenance, treatment, disaster preparedness, outreach and education, and organization of a conservation department. A selection of 64 readings provides the basis for further study of conservation administration in a research library.

PREFACE

The assumption that the conservation of library materials is good and necessary and need not be justified further forms the basis for this policy statement. Thus, the only recognized deterrents to conservation are lack of funds and confusion regarding a philosophical framework for conservation. In other words, no one knows quite what or how much to do, and there is no money to do it anyway.

A small number of major libraries have comprehensive conservation programs and separate departmental status for conservation; others are in various stages of formulating programs; and many more are recognizing the need as evidenced by attendance at ALA RTSD preservation meetings and at seminars and courses, and by the amount of inquiries directed to leaders in the field. Additionally, the Library of Congress has recently started planning for the National Preservation Program, and the National Conservation Advisory Council has published a report on national needs in libraries and archives conservation. There are many other examples, but it suffices to say that either conservation is an idea whose time has come, or those who cannot get excited about computers are searching for something equally mystifying, complicated and trendy—but less threatening.

Despite the popularity of the subject, librarianship has yet to develop logical guidelines for conservation policy. The experts disagree and are looked upon with suspicion since few of them are librarians; the problem is complicated, depressing and insidious (it appears that books are deteriorating from the inside out!); and the whole thing sounds expensive. This is not a new, flashy service for impressing trustees and boards; it is simply taking care of what we have.

This "mock" policy statement is designed to provide optimum conditions for the conservation of a research library collection. It is purposely brief and, I hope, clear and concise. The assumption is made that a budget for conservation has already been allocated and that conditions exist for necessary improvements and changes. It was personally more fun to outline a positive program (even if fictional and wildly unrealistic) than to describe the very real limitations. My thanks go to Paul N. Banks and Frazer G. Poole for their comments and criticisms of this policy statement.

Libraries attempting to formulate conservation programs need specific guidelines, but existing written statements are more plea than policy. Stated simply, if a research library wants to preserve its collection, this paper describes what it should be doing.

CONSERVATION POLICY STATEMENT

Philosophy for Preservation/Conservation/Restoration

Policies for the conservation of library materials affect every department in the library. Conversely, the way in which library materials are treated throughout the system affects their longevity. Conservation entails balancing the protection an item receives with its use.

Definition of Terms

The library strives to provide a comprehensive conservation program for its collections consistent with its needs, goals and objectives. The program encompasses a complex system of plans, policies, procedures, job allocations and resources required to implement, where appropriate, the preservation, conservation and restoration of those materials maintained for the use of the educational and research community the library serves.

"Preservation," for the library's purposes, is the action taken to prevent, stop or retard deterioration; "conservation" means maintaining, in usable condition, each item in the collection; and "restoration" implies returning the deteriorated item to its original or near-original condition. "Information preservation," as opposed to preservation of the physical object, consists of reformatting materials in order to preserve their intellectual content.

An active conservation program encourages respect for the library and its collections, reduces the loss of materials through neglect or carelessness, and conserves resources through the application of preventative and restorative measures. Conservation is a logical addition to the process of selecting, acquiring, cataloging and disseminating library materials.

The conservation policy statement formulates specific guidelines and outlines the distribution of responsibilities in order to provide optimum conditions for the conservation of the collections which are in keeping with the library's organization, policies and existing conservation knowledge and techniques.

This general policy statement pertains to collections housed in the stacks, departmental libraries and the undergraduate library. Other special collections develop policies, based on their particular situation, through consultation with the conservator and the conservation librarian.

Principles of Conservation

The conservation program is based on several broad principles:

1. Conservation is expensive.
2. Conservation is essential in a research library.
3. Treatment of each item category of materials is based on careful examination with regard to ethical, aesthetic and economic considerations.
4. Decisions to treat individual items or whole collections are made jointly by the conservator and the librarian curator responsible for the material. Selection of the most suitable treatment is a decision initiated by the librarian (who is in the best position to know the item's value and intended use) and based on the advice of the conservator, who is responsible for chosing the best combination of methods and materials.
5. A distinction is made between ephemeral items, rare or unique materials, and materials of permanent research value. This distinction forms the basis for decisions concerning retention of the original format versus preservation of the intellectual content.
6. All materials used for the treatment of library materials are permanent and nondestructive.
7. Nothing is done to a rare or unique item that cannot be undone, i.e., the treatment is reversible.
8. The library cannot justify indefinite storage of unusable library materials.

Priorities of the Conservation Program

The following list of priorities of the conservation program is based on balancing those activities designed to have the most significant and immediate impact on the condition of the collection with those designed to provide the library with a logical, unified and well-organized long-range operating program.

1. Stop destructive practices in the library.
2. Install environmental controls in the general stacks and departmental libraries, including systems for filtration of particulate matter and absorption of gaseous pollutants, air-conditioning, humidity control, and protection against the effects of ultraviolet rays.
3. Educate the library staff to recognize items needing treatment and to cease thoughtless practices.
4. Identify and isolate those materials in immediate danger.
5. Isolate items too brittle to circulate.
6. Implement broad policies for the conservation of the collections.
7. Formulate specific objectives based on the policies and goals of the conservation program.
8. Assign priorities to items needing treatment and develop procedures for treatment.

Categories of Materials

The purpose of the following categories of materials is to aid the librarian and conservator in making decisions, setting priorities and developing procedures:

1. research collections (materials of permanent research value);
2. departmental collections (collections that circulate frequently, receive heavy use within the building, and contain duplicates);

3. ephemeral materials (materials that will be thrown out, superseded or reformatted, i.e., those that receive either heavy or light use);
4. special collections (rare books, archive and manuscript collections, unique items, items of local significance, or the library or collection of a noted individual); and
5. items or collections that are especially vulnerable due to their format or subject matter.

Collections Maintenance

Routine preventative measures are central to the conservation program and include environmental control of storage areas, policies for the handling of materials, and schedules for cleaning and minor repairs. Well-organized and well-monitored maintenance procedures will prevent needless deterioration.

Environmental Controls

Optimum temperatures are 70°F in the stacks, 72°F in the departmental libraries, and 60°F in limited-access storage areas. Relative humidity is kept at 50% with a diurnal variation of 3% and a seasonal variation of 6%.

Incoming and recirculated air is treated at the intake lines to filter particulate matter and absorb gaseous pollutants. Systems should be at least 90% efficient.

Fluorescent tubes in areas where books are stored should contain UV filters or be fitted with UV filtering sleeves. Daylight in storage areas is eliminated and lights left off as much as possible.

Environmental control systems are maintained through periodic monitoring and recalibration schedules according to system specifications. Frequent fluctuations in temperature and humidity are undesirable; constant conditions should be maintained year-round.

Environmental control systems within the library should not exceed the capabilities of the maintenance department to service them. If it is difficult for maintenance crews to service the system, they may decide not to bother. Each system should be equipped with built-in monitors so that nonmaintenance library personnel can periodically determine its effectiveness.

Plastic-base Materials

Although efforts to preserve library materials emphasize paper problems, increased use of microforms as documents, preservation microfilming of deteriorated paper collections, and the appearance of magnetic tapes and reels have produced additional and equally complicated conservation problems. Commonly known as "audiovisual" or "nonbook" materials, these documents have a plastic base and so their conservation problems are similar. Plastic-base materials require a strictly controlled storage environment, regular inspection, use of inert storage containers, and assurance that no residual chemicals are present after processing.

Handling of the original document is minimized by the production of service copies.

Machines for the use of plastic-base materials receive regular maintenance and cleaning.

Exhibits and Loans

Exhibits including material from the permanent collections requires approval of the conservator or conservation librarian to ensure that the materials are not displayed in a destructive manner.

Exhibits including photographs will utilize prints, not originals. The microenvironment of exhibit cases will meet temperature and humidity specifications determined by the conservation department. At no time are exhibit cases to be located in direct daylight or under fluorescent lights without UV filters. Overall light will be controlled to the minimum level acceptable for viewing.

No item will be loaned unless its physical condition is stable. Procedures for packaging and mailing interlibrary loans will meet conservation department specifications; rare books will be packed by the conservation department.

Photocopying

Photographic service procedures include specifications designed to minimize damage to fragile materials. Because of both the practice of oversewing and the prevalence of narrow inner margins, books must often be forced open on the photocopying machine, thus increasing the likelihood of damage to the binding and the paper.

Photocopying of materials from the permanent collections is supervised by a staff member. Materials too fragile to withstand face-down copying are not photocopied. Training of the photocopy staff includes orientation in the conservation department.

Shelving

Books are meant to stand upright (except for large folios). Leaning books causes undue strain on the spine, sewing and pages. By simply keeping books neat on the shelves and in an upright position, much damage can be avoided. Shelving books on their fore-edges is forbidden as it causes the contents to pull away from the covers and destroys the shape of the spine. Books awaiting shelving should not be placed on their fore-edges.

Adequate space for examination of oversize volumes will reduce damage to the volume during use. Flat storage is provided for oversize volumes.

Books should not be so tightly packed that the patron is forced to wrench the book off the shelf—and damage it in the process.

Book Returns and Conveyors

Book return and conveyor systems will meet specifications established by the conservation department. At no time will a book be returned to the library by dropping it into a box or chute.

Shifting of Materials

Shifting of materials in the bookstacks, and movement of books in general, must be done carefully to avoid damaging the materials. Major shifts of materials will only follow orientation of the crew by a member of the conservation staff.

Books are to be supported firmly by bookends or the end of the shelf to prevent them from toppling off the truck. Book trucks will meet specifications established by the conservation department.

The staff is discouraged from trying to carry too many books as it is easy to drop a whole stack—especially when the bindings have slick, pyroxylin buckram covers.

Cleaning and Maintenance in the Stacks

Collections maintenance includes systematic and regular inspection of the holdings to identify materials needing treatment. Inspection also occurs at the time a book is discharged after circulating. No book should be allowed to circulate if it is in disrepair; rush treatment of requested books is a regular procedure of a conservation department.

A continual refurbishing program is conducted in conjunction with stack inspection, which includes cleaning shelves, dusting books, treating leather volumes, doing simple on-the-spot mending, and removing harmful materials from books. Student workers in the circulation department receive orientation and training from the conservation department as part of job training.

Routine Inspection and Repair in the Departmental Libraries

Materials needing treatment in the departmental libraries are identified during reshelving and when books are discharged after circulating. Additionally, periodic systematic inspection is made of the departmental stacks, appropriate to the volume of use of the particular library.

In the interests of efficiency and economy, routine repairs are executed in the departmental libraries. These include tipping-in loose pages, tightening hinges, reattaching bookplates and pockets, and performing minor spine repairs. Departmental staff members assigned book repair duties are trained in the conservation department.

Treatment

Selection of the most appropriate treatment for a particular item is based on the item's intrinsic or artifactual value, its uniqueness, its relation to the collection as a whole, availability of a replacement, and its physical condition and intended use. These factors are weighed by consideration of the cost of repairing, restoring, discarding, duplicating, or doing nothing. Long-term cost-effectiveness is the most important aspect of treatment selection—excluding the case of rare or unique items.

Ultimate responsibility for determining whether or not to retain an item in the collection rests with those librarians involved in collections development who are expert in subject, area and language specialties, and knowledgeable about the item's use. The ultimate responsibility for the selection of treatment for that item, however, rests with the conservator.

The purpose of conservation treatment is to increase the length of time an object will be available for use and to slow down the inevitable and continual process of deterioration.

All libraries face both the need to preserve the mass of deteriorating materials and provide treatment for individual items. Most libraries lack adequate funds for conservation. Conservation is usually a low priority and conservation responsibility is frequently scattered in a library's organization. Treatment is difficult to obtain because there are not enough specialists in the field. There are no exact published standards for storage conditions, use or treatment of library materials. Conservation in any form and for any type of library is expensive.

The library cooperates with efforts aimed at developing standards, reducing costs, utilizing scarce skills, eliminating duplication of effort, disseminating useful information, and supporting research.

Organization of the Conservation Department

The conservation department is associated with technical services because it is administratively expedient and because the majority of its functions involve the physical preparation of library materials for patron use. However, the nature of that use and the continual availability of and access to library materials is also the concern of technical services and the conservation department. These are not "behind-the-scenes" processes, but ones which dynamically reflect the purpose of the library and the use to which its collections are put.

Functions

The conservation department provides the library with a comprehensive program for the conservation of its collections, including:

1. plans, policies, procedures and guidelines for conservation;
2. specifications for environmental controls and their monitoring;
3. techniques and procedures for maintenance, binding, rebinding, repair, restoration, protective encasement, and information preservation;
4. coordination of all conservation activities in the library;
5. responsibility for the historical, ethical, aesthetic and technical components of conservation treatment;
6. liaison with the vendor holding the commercial binding contract;
7. preparation of salvage, reclamation and restoration procedures in the event of natural disaster or accident;
8. education programs for staff, patrons, other libraries and individuals;
9. cooperation with other agencies, organizations and libraries concerned with conservation;
10. measurement and evaluation of collection conditions, treatments and costs; and
11. development of a conservation reference and research collection.

Division of Responsibilities

The conservation department consists of the office of the conservation librarian and four units: collections maintenance, commercial bindery preparation, conservation treatment and preservation microfilming.

Duties of the conservation librarian are:

to

1. supervision and coordination of conservation department divisions;
2. liason with other department heads and librarians;
3. recommendation of conservation policies;
4. conservation committee chair;
5. development of standards for treatment;
6. development of techniques and procedures for treatment;
7. training of staff and interns;
8. orientation tours of the conservation department;
9. commercial binding and mass deacidification specifications and contracts;
10. contact with agencies, organizations and libraries concerned with conservation;
11. supplies and equipment;
12. budget;
13. staff evaluations; and
14. annual report.

Duties of the collections maintenance division are:

1. condition surveys;
2. maintenance and cleaning of the collections;
3. training of library staff with conservation responsibilities;
4. supervision of conservation policies in the library;
5. monitoring of environmental controls; and
6. conservation, binding and mutilation exhibits.

Duties of the commercial bindery preparation division are:

1. preparation of serials and paperback books for commercial binding.
2. clerical preparation of items for commercial rebinding.
3. coordination of procedures with departmental libraries and library departments.
4. supervision of contract obligations.
5. routine contact with the vendor.
6. shipment estimates.
7. procedures for the recall of needed volumes and rush binding.
8. maintenance of the serials binding preparation file, and
9. records of contract expenditures.

Duties of the conservation treatment division are:

1. initial screening and preparation of volumes for commercial rebinding;
2. binding of single-signature pamphlets, ephemeral items and items with unusual formats;
3. rebinding of items too fragile or valuable to be commercially rebound;
4. techniques and procedures of repair, recasing, rebinding, conservation and restoration rebinding, protective encasement, deacidification, paper repair, matting and backing, and restoration of photographs;
5. routine ordering of supplies; and
6. demonstrations of conservation techniques.

Duties of the preservation microfilming division are:

1. specifications for microform quality, storage and use;
2. searching for commercially available out-of-print, reprint, photocopy or microform copies of deteriorated items;
3. cooperation with reprint publishers;
4. specifications and procedures for the purchase, production and inspection of microform master negatives, duplicating masters and use copies;
5. reporting of microform masters generated in-house; and
6. maintenance of microform equipment.

Staff

Until recently conservation has not been taught in library schools. As a result, it is not within the scope or interest of most librarians to be informed about the conservation of library materials. The conservation function in most libraries is relegated to "patch-it-up" units without professional direction, or to commercial binderies who operate to make a profit. Thus, a primary responsibility of the conservation staff is to communicate the goals of the program to library staff members who may be unfamiliar with conservation principles. Collections conservation requires the cooperation of the whole staff.

The conservation department staff is, by the nature of the task, diverse. They possess manual skills; knowledge of technological and scientific applications of conservation; cognizance of the historical, aesthetic and ethical aspects of library materials as artifacts; understanding of the function, purpose and priorities of a research library; and business, public relations and clerical expertise.

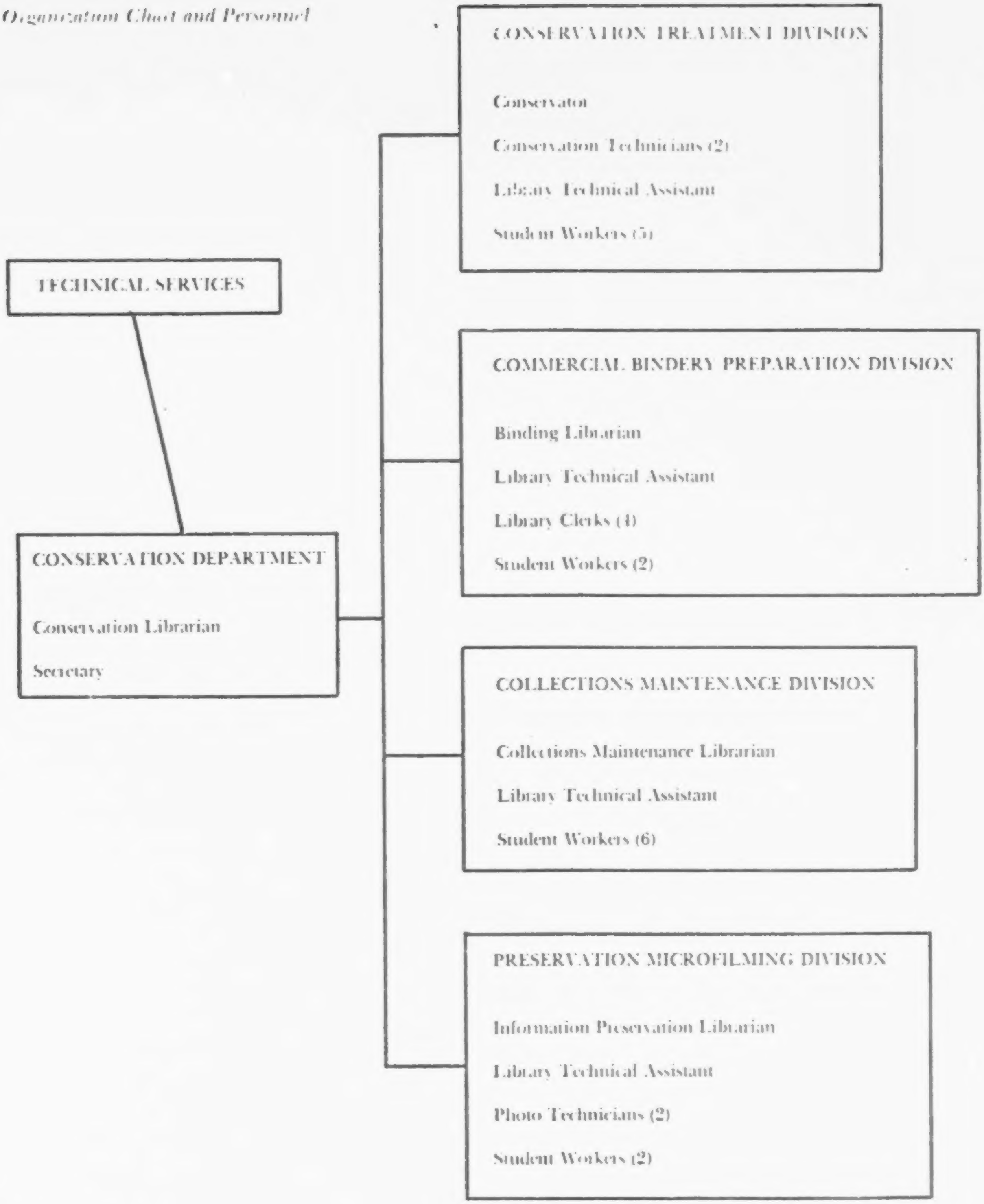
Like the staff and the task, the literature of conservation is diverse, requiring a special effort on the part of the staff to keep informed of new developments in conservation, bookbinding and reprography.

Budget

The conservation department budget consists of expenditures that are clearly identifiable conservation costs, including allowances for:

1. salaries and wages;
2. commercial binding, mass deacidification and preservation microfilming contracts;
3. equipment;
4. commodities;
5. purchase of replacements for deteriorated items;
6. office supplies and services;
7. maintenance of equipment; and
8. travel.

The costs of departmental library staff involved in conservation functions are absorbed by that library. Acquisitions relating to conservation are requested through the acquisitions department.


CONSERVATION TREATMENT DIVISION
Conservator
Conservation Technicians (2)
Library Technical Assistant
Student Workers (5)
TECHNICAL SERVICES
COMMERCIAL BINDERY PREPARATION DIVISION
Binding Librarian
Library Technical Assistant
Library Clerks (4)
Student Workers (2)
CONSERVATION DEPARTMENT
Conservation Librarian
Secretary
COLLECTIONS MAINTENANCE DIVISION
Collections Maintenance Librarian
Library Technical Assistant
Student Workers (6)
PRESERVATION MICROFILMING DIVISION
Information Preservation Librarian
Library Technical Assistant
Photo Technicians (2)
Student Workers (2)

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LJ SERIES ON
PRESERVATION No.2

ORGANIZING FOR CONSERVATION

A model charge to a conservation committee

By Robert H. Patterson

THE IMPORTANCE of librarians developing their own conservation programs cannot be stressed enough. While there are some hopeful signs on the horizon—cooperative conservation ventures in some areas, great strides in research and technology, and a growing awareness of conservation needs—today's realities are harsh. The shortage of trained conservation personnel, to work either in regional cooperative programs or in individual libraries, is not likely to be solved within the next decade. Librarians, then, must undertake the responsibilities for preserving their decaying collections. At this point, there is simply no one else to do it.

Robert H. Patterson is Director of Libraries at the University of Wyoming, Laramie. This article is the second in the *LJ* Series on Preservation; an introduction to the series and the first article appeared in the May 1 issue of *LJ*, p. 1012-17.

The following is presented as a model for the library where the need for establishing a conservation program has been recognized, but where the library may feel unprepared to embark upon such a venture without guidance. Historically, many librarians have felt that a conservation program was too technically complex a matter for them to undertake; however, there is a growing awareness in the profession that librarians must develop their own programs, particularly those dealing with preventive care. Many aspects of conservation admittedly are highly technical, and should be undertaken only by trained professionals in the field—by conservators and conservation technicians. On the other hand, many basic elements in a library conservation program can be successfully mounted by the staff of a library after carefully reviewing selective publications in the field. Armed with some basic principles and facts, a program with realistic goals can be developed. This model is offered to assist in establishing such a program. After a preliminary discussion of conservation strategies and the committee approach, a list of charges will be proposed. For each charge the purpose and goals will be explained briefly and bibliographical citations provided, with works chosen for their currency and usefulness to a conservation committee.

Broad-based approach

It is vital that conservation be viewed from a systems approach[1] involving the entire library context in which materials are selected, processed, housed, utilized, and cared for. To concentrate upon only one of these elements is to lose sight of many important factors in the life-cycle of materials and the ways in which they are used. There is a close inter-relatedness in these elements that a successful conservation program must recognize and deal with effectively. Factors librarians must face are the often difficult questions of the artifactual value of materials vs. value for textual contents; format options into which the materials can be transmuted; and the economic questions of repair, replacement, and copying.

It must be clearly understood that administrative support is essential if a conservation activity is to succeed, as ultimately such an effort will require supplies, equipment, and personnel. There will also likely be procedural changes in many departments and at many levels. Gaining administrative support is both an educational and a political process, and the best means to achieve it will vary from institution to institution. Fortunately, some recent leadership for conservation in respected national library organizations (e.g., the Association of Research Libraries) has brought this concern to the attention of directors of those institutions and others.

The committee approach to conservation has several advantages. First, it is realistic in view of the national shortage of conservation professionals. The unhappy fact is that most libraries, even if they had the funds, could not hire a conservation administrator, conservator, or conservation technician, so serious is this shortage. Second, if the committee membership is broadly and thoughtfully constituted, conservation education is disseminated widely through the library, into areas where this heightened awareness is most useful and applicable. This approach also insures a broad base of support for conservation programs, creating a general interest rather than a narrow-based concern coming from only one department or division. It is important, then, that all areas within the library with real or potential conservation responsibilities be involved in the committee.

A broad-based conservation committee's membership will typically include representatives from the following operations: 1) acquisitions and/or collection development; 2) cataloging; 3) bindery and processing; 4) circulation and collection maintenance; and 5) special collections. Special collections units clearly have a major interest in conservation, and should play a significant role on the committee. But conservation is a library-wide activity, requiring key elements from other services if an effective program is to be developed.

The committee will deal with charges largely designed to create a preventive program, but will also deal with creating a repair and restoration program. While both segments are important, the former is often more attainable in most libraries, while many components of the latter will be very difficult to design and implement.

The charges which follow are ranked in a rough priority of their importance in preserving the collection, but the order in which the committee deals with them will be determined by local conditions and constraints. Some charges will be acted upon before others. Good environmental controls unquestionably are the most important factors for sound conservation, but many libraries with older physical plants will find the goal of air conditioning the most costly single element. Once all charges are initially explored, work on those which may be more quickly attainable should be initiated.

The recommendations made by the committee should be as specific as possible in order to assist administrative officers in evaluating cost and/or procedural changes required. There obviously may be instances where the committee will not be able to provide cost, source, or other useful information, but every effort should be made to provide as complete information as possible. Acceptance and implementation of the recommendations may, in part, rest with the successful completion of this task.

The recommendations of the committee should deal with both short- and long-range goals, looking both at realistic, attainable projects, as well as long-term efforts for which financing sources might not easily be identified. A major danger in conservation planning lies in the fact that the scope and complexity of larger needs can often obscure attainable smaller goals. For example, the challenge of mass deacidification for a large collection (presently not technically or financially feasible) or air conditioning an older physical plant should not prevent or discourage planning for smaller projects. Despair and frustration are inevitable reactions to be dealt with in conservation matters, but these can be offset with small victories.

Likewise, the recommendations should suggest a tentative timetable within which each element can be scheduled and completed. The timetable should be realistic and should consider available resources. A serious attempt to set priorities for the recommendations should be made, based on both attainable goals and most serious needs. The committee's role is to make concrete recommendations; the role of the library administration is to evaluate these in light of the library's mission, and to seek funding for those of substantive value. Happily, conservation of the library's collections is an area where strong arguments can easily be advanced and understood.

Charges to the committee

CHARGE NO. 1: Examine the library's physical environment and make recommendations for enhancement of environmental factors, including an effective monitoring system.

The physical environment in which materials are housed is the *single most important factor* for conservation. Adequate control of temperature and relative humidity; protection from particulate matter and gases; and protection from light sources are all critical matters. In older libraries lacking air conditioning systems, deterioration is greatly accelerated and can be reduced only with the introduction of new systems to keep temperature and relative humidity within acceptable limits. Such systems should also be constructed to effectively filter out harmful elements in the ambient atmosphere. Screening out of destructive sections of the light wavelength band (ultraviolet in particular) is also important, especially from natural and fluorescent sources. Effective monitoring of all elements is important.

CHARGE NO. 2: Prepare a disaster plan for the library.

Every library is subject to a wide variety of possible catastrophes, ranging almost universally from fire and flood damage to specialized regional threats of hurricane and earthquake. While the safety of patrons and staff is always paramount, rescue efforts for the collections are the next priority. Libraries must plan for such contingencies by preparing ahead of time to meet them. A good plan can reduce losses significantly, and should cover 1) pre-disaster preparedness measures, and 2) post-disaster recovery measures. Typical dangers to consider include fire and/or water damage, and loss of air conditioning and humidity controls due to mechanical failure. Sources of professional assistance should be identified.

CHARGE NO. 3: Examine current handling, bindery, and processing practices, and make recommendations to bring these practices into conformity with accepted conservation principles.

Most libraries routinely handle materials, and follow repair procedures which are inimical to conservation practices. Handling practices bear scrutiny, in the areas of photocopying, shelving, and exhibition areas. Much in-house repair is characterized by the use of inappropriate materials, including pressure-sensitive tapes and acidic papers. The use of better materials consonant with conservation goals should be encouraged. Also, commercial binding methods should be examined, and the practice of oversewing should be evaluated critically if routinely applied to all materials sent to the bindery.

CHARGE NO. 4: Explore avenues which will provide the library with access to professional conservation expertise and facilities.

The national shortage of conservators and conservation technicians makes locating skilled and qualified persons particularly difficult. Libraries can require a wide variety of specialized conservation skills, from restoration and repair bookbinders, flat paper technicians, to multi-faceted conservators advising in many areas. It must be determined where such persons are available, and by consultation with colleagues and other useful information sources, these persons must be evaluated as to suitability for library work. Questions of qualifications and demonstrated capability are extremely important in an area where, to date, no nationally accepted standards for accreditation exist.

CHARGE NO. 5: Recommend what in-house physical treatment can be undertaken for minor cleaning and/or repair of materials.

The question of libraries attempting to perform some in-house conservation practices is one which divides conservators themselves. Clearly, any such ventures should be embarked upon with the greatest restraints and caution. Encapsulation for flat paper objects appears a legitimate in-house activity, and some repair of nonrare materials should routinely be effected, using sound materials and procedures. Deacidification of some materials may also be practical. Advice from a conservator should be sought before establishing an in-house activity.

CHARGE NO. 6: Develop an integrated systems approach in responding to material identified as unusable, and develop a systematic number of options as to handling, including a photoreproduction program.

Material identified as no longer able to sustain patron use should be routed through a set of procedures which raises questions regarding its condition, use by patrons, bibliographical relationship to other titles or pieces, and its artifactual or textual value. The application of these criteria will produce decisions which will lead the material to one of several solutions. These can include 1) restoration or repair; 2) enclosure; 3) withdrawal; or 4) text replacement through photocopying into various formats, including microreproduction. Furthermore, a review of the criteria used to determine rarity, or limited access, should be undertaken, as in many libraries these criteria lack recent re-examination.

CHARGE NO. 7: Identify possible sources of funding for conservation programs, examining local, regional, and national sources.

The cost of conservation activities varies considerably from small, low-outlay projects, to major capital expenditures. While some, if not most of these costs might reasonably be expected to come ultimately from operating funds, special funding can be very useful in initiating conservation programs. Groups and individuals with potential interests in conservation include historical and genealogical societies, organizations which have donated materials to the library, and grant agencies of many types. Special collections, in particular, should examine this approach. Conservation projects can be scaled to match the availability and amount of grant or gift monies. Universities' development offices are often good sources of information and advice in such matters.

CHARGE NO. 8: Establish a clearinghouse of conservation information for in-house and external use.

A major goal of a conservation program should be to gather and maintain a collection of useful materials dealing with the subject. The value to the staff is obvious, and the potential value to persons in the community should not be overlooked. The committee should also gather and disseminate pertinent information for staff use, including AV presentations, developing their own if need be. There are many persons on the staff who should receive current information on sound practices, including shelvers, processors, circulation staff, and others.

CHARGE NO. 9: Explore the feasibility of joining cooperative conservation efforts at local, regional, and national levels.

The enormous mass of materials needing physical treatment, the often highly technical nature of treatment, the costs of conservation procedures, and the critical shortage of trained conservation personnel are factors which offer strong encouragement to the establishment of cooperative conservation programs. While cooperative ventures may confront many of the same problems faced by individual institutional programs (recruiting sufficiently trained personnel, for example), cooperative approaches are likely to play an increasingly important role in meeting conservation needs. Many significant library, archival, and museum groups are currently considering cooperative conservation programs, and several additional regional centers should appear within the next decade.

Regional centers may offer a wide variety of services, including physical treatment of materials, disaster recovery assistance, on-site surveys of materials and the physical plant, and educational programs. This hopeful likelihood should not encourage libraries to postpone developing their own programs, however.

CHARGE NO. 10: The Committee will equitably divide the responsibilities for all of the charges listed above, and will accept the responsibility for monitoring the program resulting from the discharge of their responsibilities.

It is important that the numerous on-going activities of the new conservation components be monitored, evaluated, and managed effectively. Specific duties may be assigned to various committee members, based on their backgrounds, training, and capabilities. The chairperson, reporting directly to a major officer of administration, should be recognized as the conservation administration officer. The present national shortage of individuals able to act in this capacity might mean that these duties would have to be borne by the conservation committee indefinitely. Ideally and ultimately, the position of Conservation Administration Officer should be created in most medium-to-large libraries.

State-of-the-art bibliography

The criteria used in selecting items for this bibliographical section are 1) currency; 2) practicality, i.e., ease of application to library use; and 3) quality. Highly technical works have been excluded. The literature of conservation is complex and diverse. Research into any single area will usually reveal a body of useful citations. One of the greatest difficulties for the neophyte entering the field is to select from this wealth the most pertinent and useful information.

The richness of conservation literature is best revealed in two invaluable works of a bibliographical nature. The first is by George M. and Dorothy Grant Cunha, *Conservation of Library Materials*, 2d ed., Scarecrow Pr., 1971-1972 (Volume II, Bibliography). A supplemental volume is scheduled to be published in 1980. The other is by Paul N. Banks, comp., "Bibliography for the Course in Preservation of Library Materials," Columbia University School of Library Service, 1978 (unpublished document). Both titles are essential in providing access to the literature of conservation.

Of general descriptive works, the most useful survey of current library conservation practices, with a concise overview of conservation problems, is found in Paul N. Banks, "Preservation of Library Materials," Allen Kent, Harold Lancour, and Jay E. Daily, eds., *Encyclopedia of Library and Information Science*, Marcel Dekker, 1978, Vol. 23, p. 180-182. Pagination cited in this paper will be for the offprint version (The Newbery Library, 1978, p. 43). Another work, accepted as a pioneering classic, is Volume I of George Martin and Dorothy Grant

Cunha, *op. cit.* Another useful introductory survey is by Bernard C. Middleton, "Book Preservation for the Librarian," in John C. Williams, ed., *Preservation of Paper and Textiles of Historic and Artistic Value*, American Chemical Society, 1977, p. 3-23.

Charge No. 1: The Physical Environment

The museum conservation field has led the way for library environmental control, and their suggestions are widely applicable to libraries. The most concise surveys on factors to control in the physical environment are found in Paul N. Banks, "Preservation of Library Materials," *op. cit.*; and International Institute for Conservation of Artistic and Historic Works, *Control of the Museum Environment: a Basic Summary*. London, IIC, 1967. Useful works on air conditioning, humidity control, and lighting are, respectively: H. J. Plenderleith and P. Philippot, "Climatology and Conservation in Museums," *Museum*, 13 (1960), p. 243-89; Caroline Keck, "Can We Afford To Ignore the Facts?," *History News*, 30, 1975, p. 34, 51; and Robert L. Feller, "Control of Deteriorating Effects of Light Upon Museum Objects," *Museum*, 17 (1964), p. 57-98.

Charge No. 2: Preparing a Disaster Plan

The best work on disaster preparedness is by Hilda Bohem, *Disaster Prevention and Disaster Preparedness*, Berkeley, Univ. of California, Task Force on the Preservation of Library Materials, 1978. Bohem's excellent work provides a model which can be adapted to many library situations. Libraries in areas where hurricane threats exist should consult Wilbur Meneray, *The Tulane University Library Disaster Plan*, TUL, 1976 (unpublished report, available from the Special Collections Division, TUL, New Orleans, La. 70118; or from the New England Document Conservation Center, Abbott Hall, School Street, Andover, Mass. 01810).

Charge No. 3: Handling, Bindery, & Processing Practices

A complex group of library practices are represented here. One good current survey is that of Banks, *op. cit.*, "Handling and Storage Practices," p. 11-20. Further reference to the bibliographies of Banks, *op. cit.*, and Cunha, *op. cit.*, is essential to gather information about these subjects.

Charge No. 4: Provide Access to Professional Expertise

A good source for locating many (but not all) qualified persons working in the conservation fields is the membership list of Fellows of the American Institute for Conservation of Historic and Artistic Works (AIC), published annually. The paper and book conservation fraternity nationally is a small one, and many geographical areas lack qualified conservation personnel. Advice from several agencies should be sought, including the following: New England Document Conservation Center, Abbott Hall, School Street, Andover, Mass. 01810 (Phone: 617-470-1010); and Restoration Office, Library of Congress, 110 Second Street, S.E., Washington, D.C. 20540 (Phone: 202-426-5634). A longer list of persons offering assistance is found in Bohem, *op. cit.*, p. 19.

Charge No. 5: Establishing an In-House Treatment Capability

The literature of the many practices grouped under this general heading is diverse. It includes such activities as binding repair, paper mending and cleaning, deacidification, matting, laminating, and encapsulation. As above, Banks *op. cit.*, p. 21-34, offers the best survey of accepted procedures, and his "Bibliography for the Course in Preservation of Library Materials" offers a wide variety of citations for these subjects. Two particularly useful works are Colton Storon, "Care, Maintenance, and Restoration," in *Rare Book Collections* (H. Richard Archer. ed.), American Library Association, 1965, p. 74-85; and Carolyn Horton, "Cleaning and Preserving Bindings and Related Materials," 2d ed., ALA, 1969.

Charge No. 6: Develop an Integrated Systems Approach to Conservation

To date, little of anything has appeared in the professional literature on this subject, due, in large degree, to the newness of this area in library practices. The decisions required in this broad-based effort are explicit in Pamela W. Darling, "Our Fragile Inheritance: the Challenge of Preserving Library Materials," *American Library Association Yearbook, 1978* (ALA, 1978); see sections titled Replacement/Reproduction, and Choosing an Approach.

Two in-house programs, at Columbia and Yale, serve as excellent models for other libraries to emulate. The operations of the former are described in Columbia University Libraries, Preservation Department: *Binding and Physical Treatment of Library Materials, a Handbook*, Xerox document, 1976. The Yale University Libraries have developed a multi-faceted approach to conservation which exists in a broad collection development nexus. To my knowledge, no documentation has yet appeared in the literature on this excellent system. Information on the Yale operations may be obtained from Ms. Gay Walker, Preservation Office, Yale University Libraries, New Haven, Conn. 06520.

Charge No. 7: Identify Funding Sources for Conservation

Conservation is so new a subject of national concern that no one has addressed in the literature the question of funding sources. Each library must simply strive to identify agencies, organizations, and individuals potentially offering support.

Charge No. 8: Establish a Clearinghouse of Conservation Information

There is no description of this important aspect of conservation education in the literature. The value of this service and the relative ease of establishing it are too obvious perhaps to warrant such treatment. The literature on conservation is voluminous, however, and some effort clearly will have to be made to select carefully.

Charge No. 9: Cooperative Conservation Ventures

The best discussions on cooperative conservation are found in two National Conservation Advisory Council publications, *Report from the Regional Centers Study Committee to the National Conservation Advisory Council*, NCAC, 1976; and *Conservation of Cultural Property in the United States*, NCAC, 1976, see section titled "Regional Conservation Centers," p. 27-28. Two reports from the one regional library center established to date are: George M. Cunha, "A Regional Restoration Center for New England," *Bulletin of the American Institute for Conservation of Historic and Artistic Works*, 13, 2 (1973), p. 6-16; and "A Review of the Activities of the New England Document Conservation Center, April 1, 1973-June 30, 1975," *Bulletin* of AIC 16 (1976), p. 111.

Charge No. 10: The Committee Performing as Conservation Administrator

This function, as in several others above, is so new to librarianship and archival management that it has not been really described yet in the literature. Two general works on establishing conservation programs in specific research libraries which do outline the problems of conservation administration are: Jo Ann Brock, *A Program for the Conservation and Prevention of Library Materials in the General Libraries, University of California, Berkeley*, UC, Berkeley, 1975; and James W. Henderson, *Memorandum on Conservation of the Collections*, New York Public Library, 1970.

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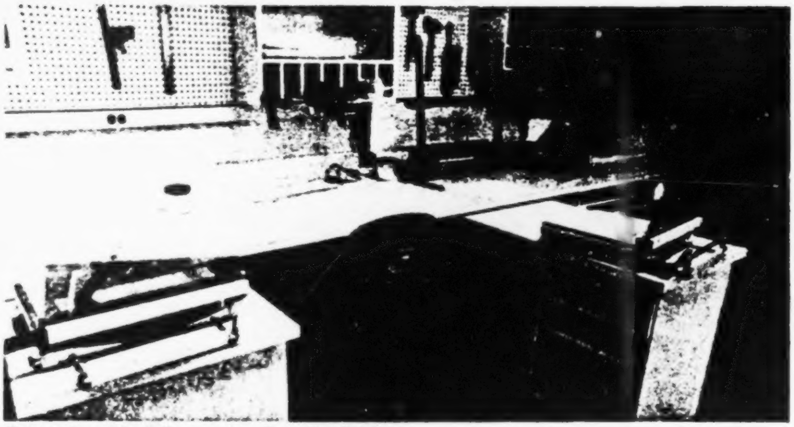
Preservation at the University of Michigan

The newly-furnished Conservation and Book Repair Unit. Photo: Don Shields

Although the University of Michigan Library's Preservation Office has existed only since August 1981, the need to improve the physical care of the collections and provide mechanisms for replacing deteriorated materials had been known for many years. Awareness of the poor quality of modern book-paper had existed since the late 1950's and early 60's but, as was the case in many other research libraries, it was not until the mid-seventies that formal action could be taken. In 1977, the Library's director appointed a task force to draft a comprehensive preservation program plan for the University Library system. After analyzing the results of a detailed questionnaire on environmental conditions and storage and handling practices in every unit in the Library, the task force produced an extensive series of recommendations. Although staffing and budget considerations precluded implementation of many of the recommendations at that time, a beginning was made by substantially increasing the budget for library binding, establishing funds for purchasing replacements of deteriorated materials, and planning a new facility for storage of fragile, valuable, and low use items at recommended temperature and humidity levels. Arrangements were also made by the Department of Rare Books and Special Collections for the quarter-time services of the conservator at the University's Bentley Library.

In 1981, after completing a five-month preservation internship at Yale University Library, the former head of the Microform Reading room was appointed to serve as the Library's new Preservation Officer. Shortly thereafter, a comprehensive preservation plan was drafted and distributed to all units for comment. The Preservation Officer began a series of visits to the individual libraries in the system to learn about their special needs and to outline ways in which the new office could assist them in improving the handling, repair, and housing of their collections. Other progress that first year included a thorough revision of the Library's contract for commercial binding to ensure that the least damaging methods were used, the establishment of routines for brittle book replacement searching, and planning for the expansion of the Library's existing Book Repair Unit into a full-fledged conservation facility. In 1982/83, with the help of a U.S. Department of Education Title II-C grant, the Library was able to purchase new microfilming and conservation equipment and began to make changes in the supplies and procedures used in both units.

In the microfilming unit, a new camera, printer, processor, book cradle, densitometer, and ultrasonic splicer were installed and different methods were introduced for targeting, inspection, and testing for residual chemicals. The unit, which had previously devoted much of its time to filming business records for various offices on campus, began to limit its attention to deteriorated library materials. We were fortunate to have an experienced and capable staff who were able to adjust to the changes readily and began, within a very short period of time, to produce preservation microfilm that conformed to Library of Congress and Research Libraries Group specifications.



Workbench and Mobile Storage Units. Photo: Don Shields

The Book Repair Unit had previously been responsible for making manuscript boxes and doing tip-ins, recasing, pamphlet binding, and minor repairs of general stacks materials. Work was performed at office desks and the only pieces of major equipment were a Challenge papercutter and one standing press. Under the supervision of the new head of the expanded Conservation and Book Repair Unit, changes in the materials and methods of repair were introduced and new services such as rebacking, resewing, mylar encapsulation, and phase boxing were made available. As part of the renovation, a

The Wei T'o Book Dryer-Insect Exterminator. Photo: Don Shields

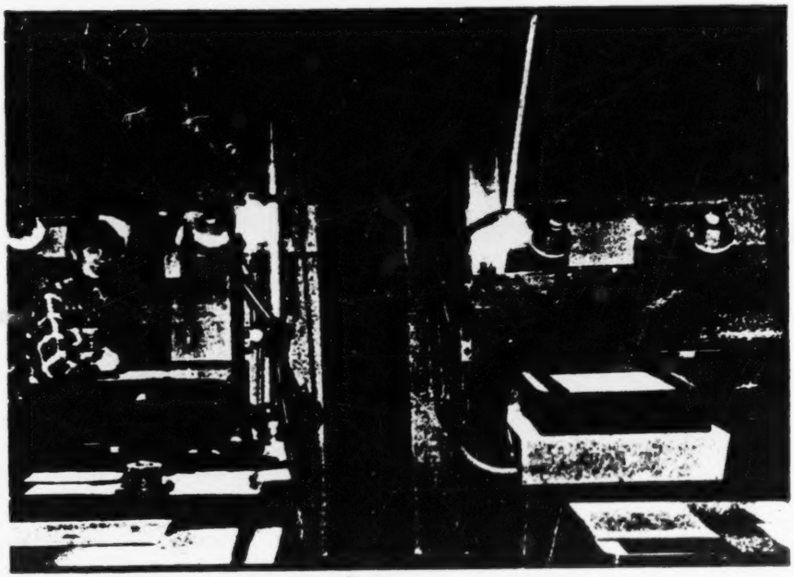
stamping machine, heatset press, board shears, and job backer were acquired. Construction of the facility was completed in December, 1983.

The desire for flexibility had a major influence on the design of the lab. In one room, work benches that are three feet deep line the walls. Individual storage units on locking casters can be moved to any location to provide additional work surface and storage for tools, materials, and books in process. They can be rolled under the work benches when not in use. Most shelves in the lab are adjustable and most tables are on wheels. The central work area features two five by eight foot tables that fill the dual need for large work surfaces and ample flat storage space. One of the tables has a built-in light box. The adjoining room, also furnished with a five by eight foot table, contains facilities for wet and chemical treatments. The three by six foot stainless steel sink is equipped with filtered and deionized water systems. Drying racks on locking casters can be rolled as a unit to the sink or individually manipulated. Aqueous deacidification is carried out by using magnesium bicarbonate solution that is prepared in the lab. A five foot wide fume hood accommodates large documents for nonaqueous deacidification or solvent treatment. Photodocumentation takes place in an alcove in the Head Conservator's office and rare materials are stored in a locked and alarmed vault. Nearby in the building are a mold fumigation chamber that uses orthophenyl-phenol and a book freezer-dryer and insect exterminator that was designed by Dr. Richard Smith of Wei T'o Associates.

The Head of the Conservation and Book Repair Unit has spent the past several months visiting the libraries to assess their needs for conservation of valuable materials. An open house in the new unit will be held next month to familiarize library staff with conservation equipment and techniques and the new services that soon will be offered. In consultation with the Library's Assistant Director for Collection Development, a plan will be devised for allocating conservation staff time and materials among all the libraries in the system. A full-time technician and additional part-time staff will be added within the next few months. We expect to begin offering full-scale conservation services by July 1, 1984.

The Brittle Book Replacement Office staff members have been occupied since early 1982 with processing microfilm orders from the Interlibrary Loan Office and the Department of Rare Books and Special Collections and meeting our commitments under the abovementioned Title II-C grant and the Cooperative Preservation Microfilming Project of the Research Libraries Group. To date, we have filmed approximately 2500 late-nineteenth century monographs in the fields of history, economics, sociology, book arts, mathematics, astronomy, military science, education, subject bibliography and radical or protest literature. In retrospect, the grants have been extremely valuable in helping the Library to acquire needed equipment, organize new procedures, and upgrade existing ones far more quickly than would otherwise have been possible.

Progress to date in the area of staff and user education includes a series of training sessions on basic care and handling of library materials, distribution of flyers and bookmarks on the same subject, a series of interviews on the local campus radio station, a major exhibit, and staff sessions on how to assess book damage and when to request repair rather than commercial rebinding. Supplies such as plastic paper clips, acid-free pamphlet boxes and envelopes, cotton string ties, and nondamaging adhesives for minor repairs have been made available to all the libraries.


The Preservation Microfilming Unit. Photo: Charles Ferrero

Plans for 1984/85 include expansion of conservation, microfilming, and brittle book replacement services to libraries throughout the system, training of additional selectors in replacement decisionmaking, sessions on disaster planning and recovery, and a series of seminars on preservation issues to be conducted as part of the Library's Research Library Residency program. A preservation manual will be compiled and distributed to all units, a slide/tape program on commercial binding will be shown, and a session on simple book repairs will be conducted by the Head of the Conservation Unit.

Many preservation issues remain to be addressed. Among them are replacement priorities, collection security, environmental conditions in some of the older buildings, and the need for change in current practices, such as photocopying of fragile materials and packaging for interlibrary loan. The Library must also begin to address the preservation implications of new technologies such as optical disc, mass deacidification systems, and electronic publishing. Many of these complex issues will take years to resolve. While the amount that remains to be done may seem daunting at times, the progress made during the past two and one half years has been very encouraging. With the continued strong support of the library administration, the University of Michigan's preservation program should be able to maintain its present momentum and accomplish most of the goals outlined in the 1977 Preservation Task Force report.

Margaret M. Byrnes
Preservation Officer
Martha Little
Head, Conservation
The University of Michigan Library

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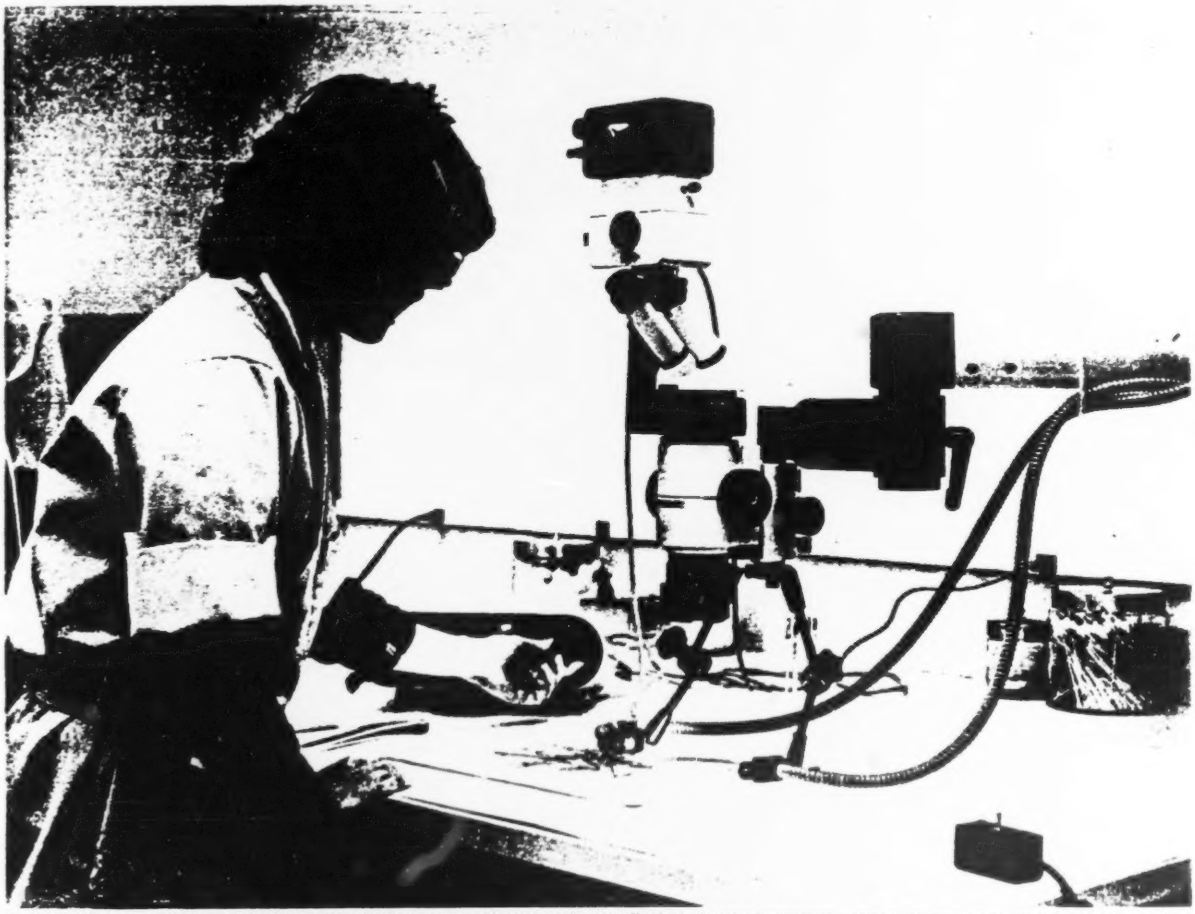
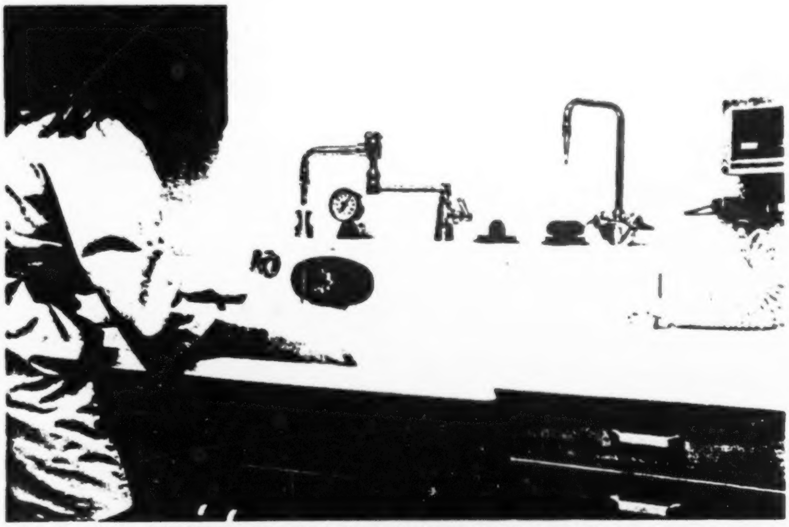
Conservation at the Humanities Research Center



Media identification, spot testing, and other types of examination and manipulation are made more effective by the use of a stereomicroscope. High-intensity cold light is provided by adjustable fiberoptic cables. The heavy stand, developed for surgical use, insulates the microscope from vibration and provides a four-foot horizontal reach. A specially-fitted 35mm camera records images produced by the microscope.

If, as Lord Clark has said, civilization requires a collective sense of permanence, conservation programs are among the things which reassure us that we are not, after all, living in a completely barbaric age. Conservation is, simply, advocacy on behalf of the future. It depends on the idea that our progeny have as much right to the products of our culture as we do. Acid-free folders and elaborate loan restrictions are really designed to extend public access—to a public not geographically remote, but remote in time.

Twenty-five years ago, the founder of the Humanities Research Center imagined a research collection which would document the creative act from first notes to final published form. Harry Huntt Ransom, professor and bibliophile, became president and later chancellor of the University of Texas at a time when it had long fulfilled the mandate of a land-grant college to provide high-quality education to the people of the state. Ransom wanted the school, in addition, to make a unique contribution to the world of humane learning. To accomplish this he proposed a great collection, preeminent in its field, upon which scholarly activity would focus. This laboratory of letters, in order to



Fiberglass sinks are fed by three types of water: Austin municipal water is usually quite alkaline. A reverse-osmosis filtration system removes 95% of dissolved solids, supplying relatively non-aggressive water to a temperature blender. Deionized water from a mixed-bed resin system is available when required.

achieve distinction, would need a subject strength not already fully covered by more venerable institutions. In modern literature, particularly nineteenth and twentieth century manuscripts, Ransom saw his opportunity.

During the following years the HRC set out to dominate this market. Major collections were acquired intact, and at more than one auction agents of the HRC bought virtually every lot offered. Such systematic effort bore fruit; on the scale by which these things are usually measured, the Humanities Research Center grew up overnight.

Today its manuscript holdings frustrate summary; they include an eleventh century Bede and Byron's *Don Juan*, manuscripts of nearly every significant modern writer from Auden to Zukofsky, and the archives of many of their publishers and agents. The HRC also incorporates the University's rare book holdings and history of printing collections, significant artwork, the Gernsheim collection of photography, and major collections relating to all the dramatic arts including the Selznick and Swanson archives.

For many reasons, emphasis has now shifted away from wholesale acquisition and a new priority has been assigned: conservation. HRC director Decherd Turner has often said that his institution has the greatest stake in conservation of any library in the world. The cause is not only "inherent vice" in many modern papers, but also the eccentric storage, display, and repair techniques to which they have been subjected. The collection items, like museum pieces, are intrinsically valuable objects, but suffer all the problems commonly found in archivaria. These problems are aggravated by quantity: 9,000,000 manuscript sheets, 800,000 bound volumes, 4,000,000 photographs, and 50,000 works of art.

Continued on Page 3

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Launching The Program

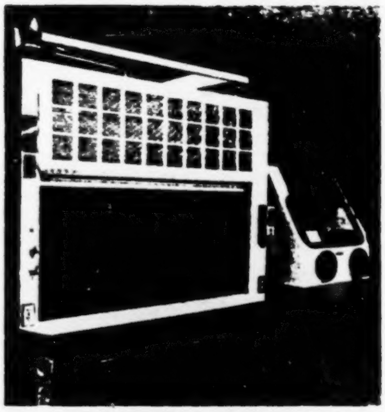
In 1980 Mr. Turner asked Don Etherington, whose long association with the Library of Congress made him especially qualified for the task, to develop a conservation program for the HRC. Any discussion of the resulting program must begin with the nature of the position created for Mr. Etherington. Both men considered it vital that the head of the conservation department have policymaking authority. Preservation decisions had to be implemented in all areas of institutional operation if anything was to be accomplished. Mr. Etherington's title, assistant director and chief conservation officer, reflects the commitment of both the director of the HRC and the regents of the University to the conservation program.

After surveying the state of the collections, Mr. Etherington established three major goals for the program's first 10 years: the hiring and training of a staff of professional conservators, the construction and equipping of laboratories, and the housing of all current holdings in stable materials. Significant progress has already been made towards all three goals.

The rehousing of such a vast collection cannot be done solely, or even primarily, by conservators. The involvement of the entire staff is required. Therefore, an in-house program has been set up, based on the phased preservation system developed at the Library of Congress. Staff members from each department are instructed by conservators in the construction and use of various housing configurations, and then spend a regular portion of their time applying these skills in the collections.

Preservation Designated The First Priority For All Staff

The cooperation of the curatorial, technical, and public service staff in this process has been gratifying. The promotion of preservation to top priority, reflected in an inevitable reallocation of resources into related areas, has required considerable administrative tact. The arrival of conservators has not made anyone's job easier. Nonetheless staff members have taken a lively interest in preservation concerns, and have contributed important new ideas and designs in the housing program and elsewhere. Statistics indicate that housing is, on the whole, proceeding as fast as supplies can be stocked.



The photography conservation lab houses one of the department's two fume hoods. A humidity-controlled "glove box" is used for preconditioning and packaging items prior to cold storage.

To hire a full complement of trained professional conservators at the outset would have been prohibitively expensive, so an internal training system was adopted. Siegfried Rempel, conservation scientist in photography, and Craig Jensen, book conservator, work with Mr. Etherington in developing the skills of the seven conservators-in-training. A senior paper conservator, currently being sought, will also play a large part in this process. The department includes a photographer, responsible for patron photoduplication requests and record photographs, a darkroom technician, and a preparator.

Laboratory Design and Construction

Much of the past two years has been occupied in the planning and construction of the laboratories, which opened officially in December of 1982. While several important pieces of equipment have not yet arrived, the labs are operational and some treatments have already been carried out. In addition to treating damaged and deteriorated collection objects, conservators will support the work of scholars by providing technical information on the physical structure of literary and artistic works. The facilities will also be used to conduct investigations into the causes of and remedies for the deterioration of materials.

The book conservation lab is appropriately structured for the nature of its work. It is fitted with fixed benches around the perimeter, and large machines such as the board shears and the job backer in the center. Each bench features both butcher-block and resin lab-counter work surfaces, and is equipped with a built-in screw press and ample under-counter storage. A separate finishing area is located at the back of the room. Tasks such as chamfering of boards, construction of Plexiglas display cradles, and tool sharpening and modification are isolated in a nearby "dirty room." Much emphasis is placed on the quality and maintenance of tools and instruments so as not to compromise the standards of work done in the lab.

The paper lab is organized for maximum flexibility. Only the examination area and the washing area have fixed furniture. The remaining work surfaces are nine 4' by 8' butcher-block tables on locking casters, which can be adjusted to standing or sitting height. Their arrangement can be altered to accommodate the treatments in progress at any given time. Conservators keep their individual instruments in rolling carts. The specialized fiberglass washing sinks are fed by hot and cold municipal water (alkaline), temperature-blended water filtered by a reverse-osmosis system coupled with carbon filters (95% pure, pH neutral, chemically non-aggressive), and deionized water (ultra-pure). Distilled water is available in the photographic lab. Fume hoods for solvent work or treatments involving toxic substances have been installed in a separate room.

The photographic conservation lab contains, in addition to treatment supplies, a large portion of the department's scientific equipment. Instruments such as the densitometer, colorimeter, and specific-ion pH meter are employed there to monitor the condition of objects during treatment, under display conditions, etc. Analytical balances, a controlled-humidity chamber, microscopes, and other research and testing equipment have been provided, along with a small darkroom.

The potential of the Humanities Research Center's conservation program has as yet scarcely been tapped. Augmented by the scientific, technical, and cultural resources of the University's academic departments, it has the opportunity to contribute new knowledge and new treatment techniques as it safeguards a great collection on behalf of the future.

Randall Couch
Conservation Department
Humanities Research Center
University of Texas at Austin

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Conservation at Princeton University Library

Preservation is the systematic maintenance of all materials in library collections. It involves examining library materials in order to determine the nature of the causes of deterioration and alteration, as well as taking measures to stop or retard them. While the terminology is far from uniform, preservation so defined is becoming a recognized field of library science. In effect, it represents the interface between conservation — the care of individual pieces in the collection — and management — the design of procedures maximizing the efficiency in the allocation of scarce resources to pursue the objectives of the library.

Collections have grown very rapidly, putting library space at a high premium; also, the deterioration of library materials independent of usage has been more rapid than anticipated. To reach a compromise between these two tendencies is the task of preservation. If collections did not grow and highly circulated works were routinely "repaired," preservation would be a relatively easy managerial task.

When collections are growing and valuable works are deteriorating with the mere passage of time, hard decisions have to be made to slow down the decay of existing works without crowding the available space for acquisitions.

The Princeton University Library, with holdings of over three and one-half million volumes and five million manuscripts, is one of the largest university libraries in the United States. As an integral part of the country's fourth oldest university, the Princeton University Library is both a major research library and a teaching library for undergraduate and graduate students. A particular advantage for Princeton students is that the ratio of students to books within the collections is the highest in the country. The Department of Rare Books and Special Collections houses a vast collection of printed books, manuscripts, scrolls, tablets, papyri, drawings, prints, and other materials. With the exception of rare collections, most of the library's books and journals are shelved in open stacks, where users can handle and examine these materials at their leisure. While this system offers exceptional opportunities to undergraduates and scholars to explore wide areas of knowledge, it also puts a heavy strain on the library's collections.

Book Repair unit in Treatments Section

Realizing the problems presented by a collection undergoing constant use, the University Librarian appointed a task force to develop recommendations for a conservation program in January 1977. The committee identified problems and investigated then-current practices in preservation in the Library. As well, a survey was conducted that revealed that forty-two percent of the books in the Library were in some state of deterioration.

Princeton launched a preservation program in 1978 with a Challenge Grant from the National Endowment for the Humanities. The Challenge Grant provided for the establishment of the Preservation Section and assisted the start-up of a basic overall program. In 1980, a skilled conservator with a background in chemistry and art history was appointed for Rare Books. In January 1981, the Library appointed a Conservation Librarian who brought substantial long-term experience in binding and collections management. Several diverse activities were consolidated into one management division called Conservation Services, and an increased emphasis was placed on building strength in personnel and programs. The main responsibilities of the Conservation Librarian are to manage centralized services for all parts of the Library system in binding, deacidification, preservation, and book repair.

Initial projects for Conservation Services included upgrading treatment facilities and hiring three treatments assistants who began an intensive training program. A tremendous boost came to the program at this time with the receipt of twenty-five percent of the endowment funds in the Campaign for Princeton earmarked for conservation. An ongoing fund-raising effort exists within the Campaign to further endow the conservation program at Princeton, providing for the expansion of activities, facilities, and staff.

Conservation Services has an educational purpose as well — to make library users and staff aware of the preservation problem. General staff training has been addressed with the establishment of two seminars: a Conservation Services Orientation and a Prebinding Workshop. These are open to all staff and have been well attended. There is also a conservation stop on the library orientation tours given each fall to six hundred students, which serves to further educate the university community about conservation.

Conservation Services: Operational Sections

Conservation Services is divided into three operational sections. The first, Prebindery, is a remnant from the past, formerly called "the Bindery," but now with a new face. Binding quality is carefully monitored as a result of conservation policies emphasizing the long-term durability of materials. The other two, Preservation and Treatments, are new and resolutely forward-looking.

Prebindery Section

This section is divided into two units, Serials and Monographs, and is comprised of a supervisor, Teresa Burroughs, and three staff members — Tracey Woods, Joan Van Felton, and one vacancy. There are from one to three student assistants at any time, helping with routine duties and handling the spine titling. The supervisor has five years experience in all aspects of Prebindery operations.

Items are sent to the Serials Processing Unit from the Serials Division, branch libraries, Preservation, etc. Upon arrival, they are distributed to two of the staff members for identification, then sorted and shelved alphabetically by title. Processing occurs by checking the title against the Serials Binding Record, an historical file containing over thirty thousand title records. A local Decwriter and modem access the unit to the main database of Information Conservation, Inc. (ICI); title numbers are typed into the Decwriter, which prints slips with each volume's title and slot information for stamping the title on the spine. Serials are sent in weekly shipments and have a one-week turnaround time at the commercial bindery. The total processing time for a volume is between twenty-five to thirty days (Serials Division to Conservation to commercial bindery to stacks).

Prebindery assumes full responsibility for collating and decision-making, although these functions could be done by the commercial bindery. Conservation Services gets a much improved price per item (one-third less than normal) and collating in-house is a way of controlling the quality of binding. The emphasis here is on quality: choosing the most appropriate binding in relation to the type of volume, paper quality, and method of affixing pages, rather than treating each volume in the same way. Conservation Services is now in the process of reviewing policies concerning serials made of newsprint, based on the principle that decisions should be made early enough to prevent costly repairs in the future, even if the best long-term alternative is more expensive today (see Preservation Section).

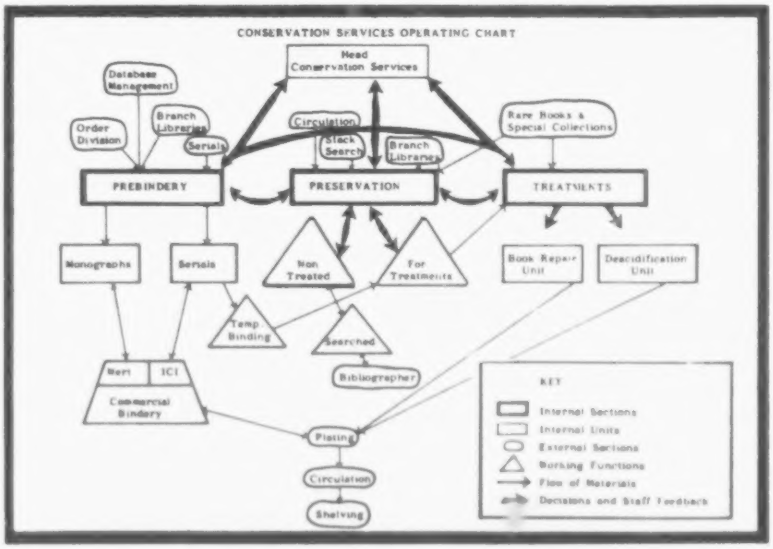
In the Monograph Processing Unit, items are received from the Order Division, Cataloguing, Preservation, branch libraries, and Database Management Section. Items are sorted upon receipt according to paper and binding structure. Weekly shipments are sent to Wert Bookbinding. All monographs are now controlled through the Geac circulation system, requiring that each item be put into the Geac system and charged to Prebindery. The supervisor creates patrons specific to the twenty different binding categories handled by Wert (for example, cloth and mylar covering material with three sizes each of recase, adhesive bound, oversewn, cleat sewn, and fold sewn), and then charges each book to the appropriate category. When books return from the bindery they are checked for quality, discharged on Geac from the binding shipment, and sent on to Plating. Geac files give the staff instant access to book records for in-process queries and eliminate the time consuming manual files of the past. The Prebindery Section processes sixty-two thousand items per year.

Preservation Section

The Preservation Section is the management interface among Collection Development, Technical Services, and the physical care of the collections. It receives all library materials coming to Conservation Services requiring repair or replacement. Items come from circulation, selectors, branch libraries, and as a result of stack searching by Preservation staff.

This Section is headed by Preservation Coordinator Dorothy Quick, who has over twenty years experience working with commercial binding, in-house treatments, and an involvement with preservation at Princeton since its inception. The staff includes an assistant, Peggy Lawson, and Preservation Specialist Susan Batton. Preservation is centrally located and answers queries for Conservation Services as a whole. Preservation controls all materials through the Geac system, inputting books and charging them to the Section so that users can locate all items within the unit. Staff members review each incoming item and choose a practical preservation alternative. This may be repairing, rebinding, transferring to an appropriate collection, or searching. This selection is based on the condition of the paper, previous use, possible artifact value, overall durability or strength, the current binding, number of copies or editions, and its potential for repair. A bibliographic search is conducted for those items that cannot be routinely treated. Searching involves a thorough investigation of the public catalogue and other editions, the stacks to check physical condition, trade bibliographies, National Register of Microfilm Masters, and/or other resources. After the search, a possible solution is itemized in consultation with the subject selector, noting costs, relative value of the book, rarity, and the amount of use. Options include:

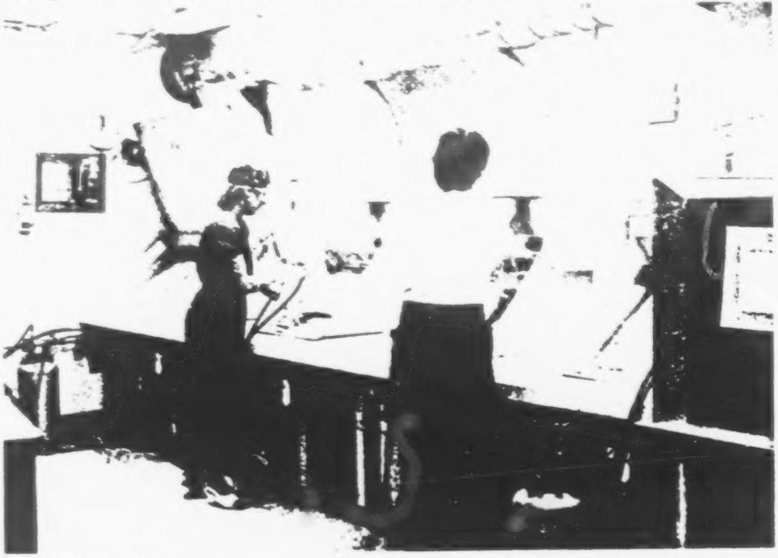
- ☐ **Withdrawal** 2200 items were withdrawn without replacement in 1983/84; mostly copies and duplicates. These items travel on to the twice-monthly duplicate sales.
- ☐ **Replacement** Ordering commercially produced reprints, film, or fiche.
- ☐ **Reproduction** (six hundred books per year) When commercial reprints or film are unavailable, books can be reproduced in-house. The Photoservices Department, which reports to the Assistant University Librarian for Administrative Services, can produce film or fiche in master negative and positive service copy, as well as double-sided photocopying on acid-free paper. Photocopied replacements are then sent to the commercial binder.
- ☐ **Transfer** Many items are routinely brought to the attention of a Rare Books curator, such as early imprints, or items with particularly fine illustrations or bindings. Over two hundred books are transferred to Rare Books each year.
- ☐ **Repair** Items fit for repair are checked against companion volumes or copies in the stacks before going in to Treatments. Extensive repairs can be done in the Treatments Section, but


CONSERVATION SERVICES OPERATING CHART

only if recommended by a subject selector.

The preservation assistant coordinates the preservation rebind program, processing one hundred and fifty books weekly to Wert Bookbinding for recasing, after the text blocks have been removed from their cases in Treatments. These are books requiring new cases, with good paper quality and intact sewing, and of no artifactual value. This program has proved to be a cost-effective way to handle a large volume of books requiring recasing.

Preservation also houses and maintains an extensive conservation reference library that contains two hundred and sixty books and over one thousand articles. Covering most aspects of conservation, the library is particularly strong in the area of deacidification, and the staff perform literature searches regularly, as well as answer queries.



Deacidification Unit

The Preservation Section handles all requests for missing pages within the library. In conjunction with Inter-Library Services, replacement pages are returned to Preservation and then forwarded to Book Repair for tipping-in. The Preservation Coordinator handles most aspects of the Newsprint Serials Treatment Review. Items printed on paper containing ground wood are identified and set aside for selector review. The physical pieces are reviewed by the Conservation Librarian and the less obvious cases are tested for lignin. The selectors choose among several alternatives: deacidification, filming, temporary binding, little used material, commercial binding, and to cease ordering. The selector's decision is recorded in the Serials Binding Record and all units are handled in the appropriate manner in the future.

Treatments Section

There are four full-time staff members in this section: Jennie Carson; Amalia Llorens; Donna Szeker; and Richard Frieder, the Head of Treatments. Two more staff members, Chris Ocker and Gene Rzuczek, work part-time. In addition, from one to four part-time student assistants are usually working in Treatments.

This section is responsible for all in-house treatments, including deacidification, fumigation, and book repair.

The Deacidification Unit was born from a decision to make the routine deacidification of materials a Library priority. The unit is middle ground between the one-off approach used in many conservation laboratories and mass systems, such as the one at the Public Archives of Canada. Actual planning for the unit started three years ago, but in October 1982, Conservation Services received a Title II-C Grant that in part covered the unit's capital costs and the two initial deacidification projects for the Department of Rare Books and Special Collections: the Holden and the Edwardian Novel Collections. The Holden Collection on the History of Women was assembled by Miriam Holden and presented to Princeton after her death. It contains books, periodicals, manuscripts, clippings, photographs, cartoons, letters, and other materials about women and their achievements. The Edwardian Novel Collection includes lesser known authors who cover many common types of Edwardian novels: historical, regional, romantic, sensational, political, and working class.

The unit was designed by Robert Parliament, the Conservation Librarian, and cost about $55,000. It consists of five individual work stations/spray booths connected to a ventilation system. The stations are spaced across a countertop and each is equipped with a spray gun to apply the deacidification solution, Wei T'o #2 (Methoxy magnesium methyl carbonate). The design of the spray booths provides support for the item in treatment.

The operator applies the solution page by page to books or the individual documents and works of art on paper. The ventilation system carries away overspray, and allows the operator to work under safe conditions. Screening items for treatment, quality control, training, and system maintenance is provided by the Head of Treatments. This unit has proven its effectiveness at a relatively low cost per item (averaging approximately $12 each). Specific policies for selecting materials for deacidification are not yet standard, but priorities can be set by individual selectors. Handling a large and special project for Rare Books in the midst of more routine work demonstrated the ability of Conservation Services to develop a successful management system.

Fumigation is done in the Vacudyne Unit, contained in a specially constructed room outside of Conservation Services. Because fumigation with ethylene oxide is currently a matter of great controversy, the present policy is to operate the unit as infrequently as possible. The University Occupational Health and Safety Office has cooperated in testing during and after operation of the unit, and the unit was found to operate within the OSHA safety standard. The entire process is under review and alternatives such as freezing, fumigation with other chemicals, and not fumigating at all, are being considered. In an effort to reduce use of the Vacudyne Unit, mold and mildew are treated topically with isopropyl alcohol whenever possible.

The Book Repair Unit handles a wide variety of work, including taking books down into signatures; resewing; recasing; mending pages, prints, and maps; archival laminating; leather treatment; tape removal; temporary binding; preparing books for the commercial bindery; construction of phase boxes and book wrappers; mylar encapsulation.

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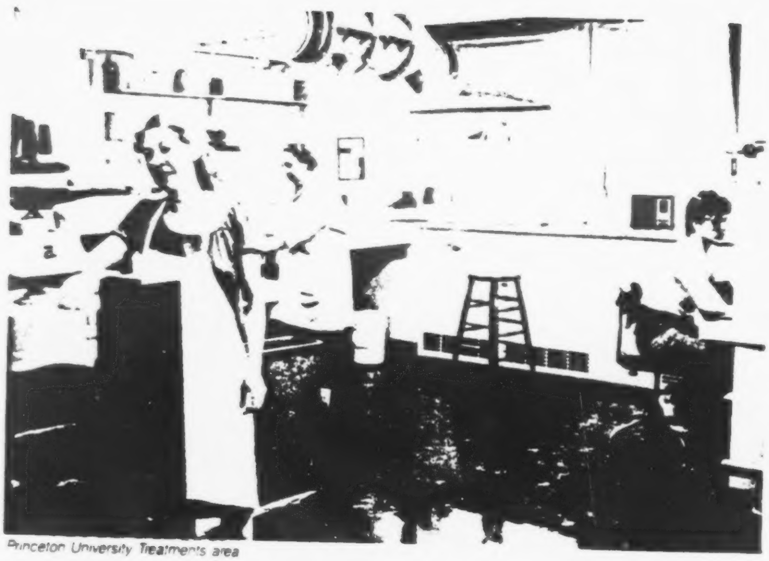

Princeton University Treatments area

and other book repairs ranging from minor to complex.

The procedures were initially established by the Conservation Librarian. When necessary, the Head of Treatments adds new procedures, or reviews and updates those already in use. All processes meet conservation standards within the context of the item's function in the collection.

Decisions concerning the most appropriate treatment for each item are routinely made by the Head of Treatments. If very complex and therefore expensive treatments are required, he may consult with the Conservation Librarian or the Preservation Section for advice. The work is then allocated to the members of the staff, along with a work sheet where they note the type of work and the amount completed each week. This provides statistical information by which results can be measured. The Treatments Section handles approximately fifteen thousand books per year.

The Head of Treatments, who has nearly ten years of bookbinding experience, trained previously at the Camberwell School of Art and Crafts, the Folger Shakespeare Library, and worked five years in private practice. Other members of the Treatments staff have some previous bookbinding experience, but for the most part have trained at Princeton. Some of the staff also pursue outside studies, such as Northeast Document Conservation Center workshops, or classes at the Center for Book Arts.

The Conservation Librarian, Robert Parliament, reports to the Assistant University Librarian for Administrative Services. He is ultimately responsible for the activities of the three sections, as well as for all decisions concerning personnel, developing facilities, purchasing, and managing finances. Once authorized by the Library administration, he is the one who may assist in fund-raising, establishing priorities and objectives, and matching those with available resources.

The system has worked well because the Conservation Librarian is a conservator and his technical qualifications allow him to provide strong guidance to the staff. He came to Princeton after eleven years as the Chief Conservator and Director of Parliament Conservation Centre in his native Vancouver, Canada. Conservation Services is a relatively small division, but its Head is planning for growth, based not only on available resources, but also on an increasing awareness of the Library towards preservation. An important part in the role of the Conservation Librarian is publicizing the services Conservation Services can provide and the guidelines that Conservation Services follows. This publicity is consciously done through orientation tours and prebindery workshops. The recruitment of a Head of Treatments enabled the Conservation Librarian to devote more time to relationships with other professional staff.

It is unfortunate that the relationship between conservation and management has not attracted sufficient attention in the library science literature, mainly because it is not yet standard practice in research libraries across the country. The success of the Princeton program is largely due to the combination of conservation expertise, managerial talent, and personal leadership of the Conservation Librarian. However, there are organizational and institutional difficulties in the full implementation of the management model. The major one is the existence of two separate conservation departments, one in charge of the general research collections in the Library, the other in the Department of Rare Books. This creates duplication of work and the lack of common objectives in the fight against the deterioration of the collections. It would be more effective to have only one conservation department, where the specialists in paper and book restoration would work in close relationship with the general conservation policies of the Library. This is the organizational structure at the University of California-Berkeley Library, where conservation procedures depend only on one department head who has followed a management-conscious conservation system under the direct guidance of the Library administration for the University of California.

As the relationship between ideal and real is often distant, individual conservation departments usually have to fit into an existing institutional policy. In this light, the maintenance and care of Princeton's collections are effectively carried out by the personnel of Conservation Services. Each section within the division works in close relationship with the others. The need to maintain communication channels, along with clear objectives, is a necessary condition for success.

Managerial qualities are as essential as technical expertise in running the conservation program. In that regard, a background in private practice has fostered a pragmatic attitude that is a form of insurance against a cumbersome administrative structure, and promotes innovation both from the Conservation Librarian and from the staff. In sum, the importance of combining management and conservation techniques in devising and implementing a preservation strategy has been well demonstrated in Conservation Services at Princeton University Library.

Maria Luiza de Macedo
Former conservation intern at
Princeton University Library

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CAN

Conservation Administration News

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Preservation Efforts at the General Libraries, University of Texas at Austin

Revision of a presentation made at the November 11, 1985 meeting of the Southwest Association for Conservation of Historic and Artistic Works (SWAC).

Some significant first and second phase preservation is going on at several of the libraries within the University of Texas' General Libraries system, in spite of the absence of a chief conservator (the position of Conservation Coordinator for the General Libraries will be advertised soon), or an aggressive, all-encompassing program with its own full-time staff. Three approaches are being taken: preservation by administrative mandate, the pursuit of grants for specific tasks by individual administrators, and the funding of specific tasks by the library budget.

The Preservation Committee

The Preservation Committee has, for several years, been developing a group of Preservation Guidelines modules, entitled *Staff Training Manual for Preservation of Library Materials*. Thse modules present guidelines for Circulation, Stacks Maintenance, and Processing staff, and cover such topics as service microforms; transportation of library materials; in-house exhibition of library materials, and handling, storage, and preservation of audio-visual collections.

A final draft of the *Manual* was, at the time of this speech, being re-written with a view to making the style and format consistent throughout, and may be bound and released by Spring. The *Manual*, once completed, will be distributed as separate modules to the appropriate department heads within the General Libraries system. Copies will be given to all staff members to whom the information applies. The *Manual* will be published as part of the *Contributions to Librarianship* series, funded by UT General Libraries. Notices and ordering

Rolled materials in the Architectural Drawings Collection.

information will go out to the approximately ninety-two libraries that are members of the Association of Research Libraries (ARL) and to publications such as *Abbey Newsletter* and **CAN**.

In its early years, the Preservation Committee researched and wrote a "Disaster Plan for the General Libraries." It has reviewed films produced by Yale and Southern Illinois Universities about basic preservation for library staff, acquired the films, and arranged periodic showings. It has recently acquired the Library Of Congress-produced slide/tape presentation, "Handling Books in General Collections," and has set dates for showing the presentation to new staff members.

Work in process and flat materials storage in the Architectural Drawings Collection.

The Architectural Drawings Collection

When I visited the Architectural Drawings Collection, I was greatly impressed with how well-organized the collection was, in spite of the growing mass of material with special problems to be treated. I was intrigued with some of the problems, too.

The collection houses drawings, watercolors, photos, and documents. One of the prime uses of the collection is in the restoration of old buildings. Architects call for building plans, specifications, and detail drawings. Usable copies must often be made to the same scale as the original drawing.

Diazo printing is the traditional and most widely used copying method, but the ammonia associated with this process poses problems for a conservator. Diazo prints must be aired for a few days so that some of the ammonia fumes will disperse. The staff, therefore, does not use the Diazo process unless a patron has donated drawings and requests Diazo prints. Velox prints are made when possible. They can be made to scale, and do not have the chemical problems of the Diazo prints. However, they cost $50 and up.

The staff encapsulates some drawings, but this can be extremely expensive (in time and materials) because of the large size of the drawings. Lilah Stillson, who is in charge of the collection, keeps a list of materials, in order of priority, that need to be encapsulated.

Many drawings have to be rolled into tubes. This creates the problem of where to store the rolled drawings. Drawer space being scarce, Lilah has to pull material out of drawers, if it can be rolled. Full-scale detail drawings, because of their huge size, must be stored rolled. There are now eight hundred to nine hundred of these drawings in the collection.

Some materials can be neither rolled nor stored in drawers. Oversized watercolors fall into this category. These watercolors must be stored flat, but where? They can sometimes be eight feet long. The stopgap solution now in effect is to put the drawings in huge folders and lay them on top of the drawer cabinet, where there happens to be a sufficiently broad surface.

The collection includes a lot of photographs. They are stored in mylar sleeves in document boxes. This seems to be the standard storage method for photo prints throughout the General Libraries. Negatives are stored in four-flap pH neutral paper enclosures, and these are put into boxes.

Some materials, especially watercolors, are placed in archival mats. About four hundred drawings in the collection are matted. Drawings executed on starched linen are often taken out of mats to make space for more fragile drawings. Drawings and paintings on acidic illustration board are put into sink mats to make them easier to handle.

Some drawings arrive folded, and the folds must be relaxed if the drawings are to be properly stored. Brittle rolled drawings might require a stint in an improvised humidification chamber before they can be stored flat.

The School of Architecture sometimes sponsors exhibits of materials from the collection. A set of exhibit guidelines, applicable to the sorts of material it stores, is available.

The Barker Texas History Center

The Barker Texas History Center (TXC) houses books, documents, newspapers, manuscripts, photographs, and ephemera. However, most of the preservation projects center around treating and storing paper artifacts, microfilming newspapers, and housing the photography collection.

Unprocessed materials are stored in cubic-foot storage boxes, then accessioned, and eventually re-housed.

There is a library budget-funded ongoing newspaper microfilming project, in effect since 1981. The Center microfilms its own newspapers which are in critical need because of their deteriorating condition. It has compiled a list of these titles. Afterward, the newspapers are retired to dead storage in the Collections Deposit Library (CDL). It also microfilms newspapers from other institutions or individuals. The newspapers are kept and the donor receives a microfilm copy.

For the past seven months, the Center has been reorganizing its newspaper stacks, noting those series in need of microfilming, and pulling out small runs and single issues to be stored separately, in acid-free folders and boxes.

Untreated and unmicrofilmed newspapers in the stacks are sometimes sandwiched between pieces of corrugated board on a temporary basis. There are plans, however, to interleave sheets of acid-free paper between the boards and the newspapers.

Collections of newspaper clippings are photocopied onto one hundred percent cotton bond, and the clippings retired.

Microfilms are shot on a microfilm camera located in TXC, and sent to the Texas State Library to be developed.

Manuscript collections are separated out and re-housed. Rolled or folded material may be relaxed either with light weights, or in an improvised humidification chamber.

There are half a million artifacts in the photography collection, including prints and negatives. Prints are placed in ready-made mylar sleeves and then into boxes. Negatives are stored in four-flap enclosures in boxes. Slides are stored in safety-store pages.

Barker Texas History Center.

A book repair unit, headed by a staff member trained at the central book repair unit for General Libraries at the Perry Castaneda Library (PCL) has been started. The book repair technician performs superficial repairs on non-rare books, does mylar encapsulations, makes phase boxes, and repairs documents with heat-set tissue.

The treatment and storage methods at TXC derive largely from Society of American Archivists (SAA) literature, such as *Archives & Manuscripts: Conservation* by Mary Lynn Ritzenthaler, and from contacts with, and seminars taken at, the Conservation Department at the Harry Ransom Humanities Research Center.

As far as temperature and humidity are concerned, most of the libraries in the UT General Libraries system are at the mercy of the University's central physical plant. TXC's temperature is set at seventy-two degrees Fahrenheit, building-wide, but temperature fluctuations can occur near the picture windows. There does not seem to be any prospect of individual libraries seceding from the University's temperature controls to establish their own preferred temperature. The stack areas have been located in the core of the building, where there are fewer temperature fluctuations, and the temperature is slightly lower.

The Center is planning to get ultraviolet filter film for the windows, and ultraviolet filter tubes for the florescent lights.

Some insects can be found in the stacks at TXC. Spraying has become problematic because of OSHA standards of safety for employees. Many poisons can also have residual effects on patrons using the materials. The University has a fumigation chamber that has never been used because of the lack of a licensed operator.

Continued on page 21

University of Texas
continued from page 3

In-house exhibits at TXC follow the preservation guidelines outlined in the SAA exhibits manual.

Practically all preservation bases have been touched at TXC, or at least considered. There seems to be a great deal of energy at work here. I was impressed with how smoothly the preservation effort was run, and the relative quantity of things that had been accomplished.

The Benson Latin American Collection

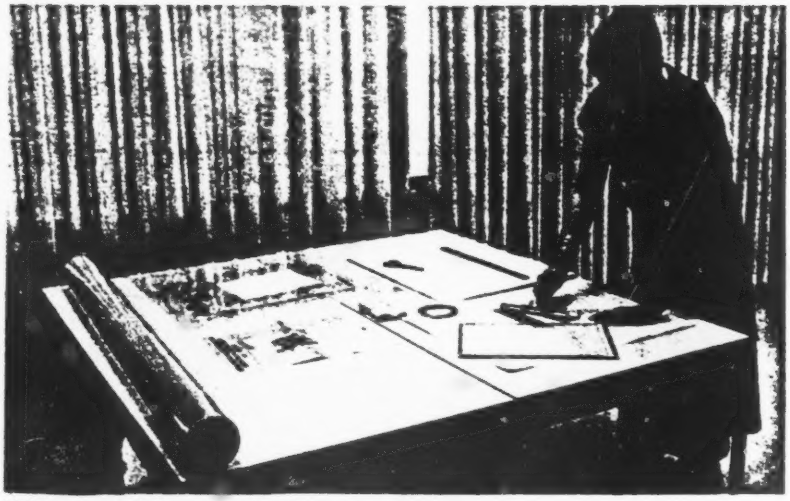
Materials housed at the Benson Latin American Collection (BLAC) include books, pamphlets, newspapers and other periodicals, maps, microfilm, audio-visual materials, manuscripts, documents, photographs, and posters. All rare materials are housed in closed stacks.

Incoming rare materials, with the exception of rare publications cataloged by the General Libraries Cataloging Department, are accessioned, arranged, and stored by BLAC staff. Manuscript materials are placed in upright, acid-free, archival document boxes. Audio-visual materials are usually stored vertically in their original containers. Additional preservation activities, such as refoldering in acid-free folders and removing rusting staples and paper clips, are done as time permits. Deteriorated or fragile flat materials may be encapsulated. Non-rare paper materials may be repaired with heat-set tissue.

Photographic prints are placed in polyester or polypropylene sleeves, and these are put in acid-free boxes, either of the telescoping, shoe box, or drop-front variety. Negatives are put in pH neutral four-flap enclosures, then into boxes.

Acquisition statistics are recorded either in linear feet (for collections) or by item (for photographs and other audio-visual materials). Preservation statistics are generally not maintained.

In 1981 and again in 1982, the BLAC received a grant from the Department of Education under the Title II-C Strengthening of Research Libraries Resources Program, to microfilm pre-1950 Latin American periodicals. Items chosen for preservation microfilming had to be of research value, in deteriorating condition, scarce, and not previously filmed.



Mylar-encapsulation of materials.

The grant provided additional staff to prepare the materials and do the filming. Over six hundred titles were microfilmed.

In 1982/83, the National Endowment for the Humanities funded a project to arrange, describe, and microfilm the records of the Cuban Consulate at Key West, Florida, covering the period from 1886 to 1961. After the filming, the original documents were returned to Key West in acid-free containers and folders.

Two needs expressed at the BLAC are for more preservation-related staff and for temperature and humidity controls in the stacks.

Collections Deposit Library

The Collections Deposit Library (CDL) is used to store materials not in circulation, such as microfilmed newspapers, and rare items of all sorts.

The lower levels of CDL have been plagued in the past by leaky pipes, and by high humidity caused by the underground springs over which the building was constructed. However, the top three levels were checked with a hygrometer and found to have an acceptable relative humidity for most library materials. Humidity controls could be effectively implemented there. This opens the possibility of storing the more valuable materials of the collection on these floors.

A lot of housecleaning needs to be done at CDL to provide shelf space for material that really belongs there. In the past, CDL had been used as a dumping ground for problem material, or material of no use or value which could nevertheless not be thrown away. Several ranges of shelving on the first floor are filled with stacks of pamphlet binders. These could be stored in a more appropriate place.

The Perry Castaneda Library

The Perry Castaneda Library (PCL) recently established a caged Special Collection for rare materials and materials susceptible to theft and mutilation. Materials in the Special Collection must be paged; paging requests are collected, and the paging takes place twice a day. High-use materials are put in Reserves, or portions of them may be photocopied and put in Reserves.

Security for library materials poses a problem for most research libraries. A series of exhibits in the lobby display cases has sought to make patrons aware of the problem and encourage them to keep an eye out for thieves and mutilators. The next issue of the General Libraries Newsletter will focus on security.

In 1984, General Libraries began the systematic use of acid-free pamphlet binders, and designed, tested, and implemented the use of acid-free tear sheets to record temporary processing information.

In response to the module on "Transportation of Library Materials" produced by the Preservation Committee, special boxes were purchased for serials traveling by inter-library mail.

Also located at PCL is the central Book Repair unit for General Libraries, which re-evaluated its repair procedures in 1982. It adopted techniques which reflected sound bookbinding practice and recent advances in research library preservation. New, archivally-sound materials were ordered, and the unit continues to monitor nationwide trends in book repair technique. At present, the unit takes as its models the repair units at Brigham Young University, Southern Illinois University, the Library of Congress, Columbia University, and the Indiana State University System.

Page repair with heat-set tissue in the Central Book Repair Unit of the Perry Castaneda Library.

With a staff of two full-time workers, the unit faces the repair needs of a five million volume collection. It therefore trains staff members in most General Libraries units to make minor or temporary repairs on-site. Library-wide, these repairs average six hundred volumes in a month.

All materials judged to be rare or valuable are placed in phase boxes and remain untreated. Non-rare books are either repaired or sent to the University's contract binder. Our present binder oversews most items but will, on request, recase items using the original sewing. The binder will also re-glue perfect-bound items whose pages are coming loose.

Film Library

The film library recently set up a microfilm/microfiche cleaning operation for its own materials and for materials from other General Libraries units.

Conclusion

Possibly the two most important factors in a preservation effort are the executive structure of the program: who decides what tasks to undertake, and how the

Microfilming of newspapers plays a very important role in the Barker Texas History Center's preservation effort.

execution of these tasks is delegated among administrators and staff; and where the money for supplies and delegated staff time comes from.

Within the General Libraries system, the executive structure at present consists of individual administrators and staff members donating their time to carry out preservation measures researched either on their own initiative or in a committee. The result is an uneven effort throughout the system, some units taking a distinct lead, and others encountering blocks of one kind or another. Communication between units is voluntary and sometimes does not take place. The Preservation Committee, while it promotes communication between preservation-active units, is essentially a group of individuals gathered together to perform given tasks; it is not a quorum of all individuals involved with carrying out preservation measures within the system, and its effect is not to administer a program via executive council, with consistent meeting-to-meeting reportage and decision-making.

The second factor to consider is where the money comes from, and here we encounter a situation not fully thought out or systematized. Certain units receive funds for microfilming projects from federal grants, others from the library budget. Staff time to work on preservation projects is scarce or nonexistent in some units, and adequate enough to carry out significant projects in others. Who decides these things? It appears that funding could come from a variety of sources—federal, private, and institutional. The individual unit administrator and his/her staff often take the initiative in making requests for funds.

The ordering of supplies to carry out preservation projects, assuming one can count on enough staff for the projects, can be uncertain. Supply allocations can vary from year to year. Ordering procedures can change unexpectedly, and are confusing to begin with. An ordering procedures manual is needed, and should be revised and re-issued as the rules change.

In spite of these obstacles, much can be accomplished by informed individuals, both administratively and on-site, through a concerted effort to obtain funds for supplies and equipment, and to create preservation-related positions or alter existing job descriptions to include some preservation work.

Richard W. Horton
University of Texas at Austin

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Preservation at Indiana University Libraries

The Indiana University Libraries has three components that reflect the statewide responsibility of the university: the Bloomington campus libraries, housing the University's research collections in the Main Library and fifteen branches (including the rare books and manuscripts of the Lilly Library), and eleven Halls of Residence libraries; six regional campus libraries, supported by centralized technical services in Bloomington; and Indiana University-Purdue University/Indianapolis, served by six libraries.

The libraries on the Bloomington campus have grown from five thousand volumes in 1829 to over 4.2 million volumes, making it the fifteenth largest academic library in the country. These libraries circulate well over one million items per year to members of the university community, to other institutions, and to the residents of the state who have free and open access to the collections. Such heavy use takes its toll on the materials, especially those printed since the mid-nineteenth century, on acidic paper now embrittled and fragile.

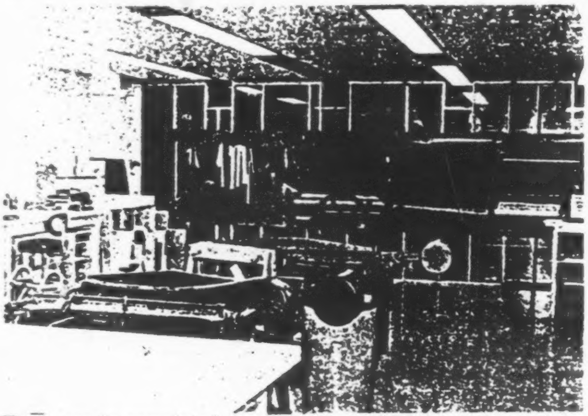
In 1983, the library administration appointed a Preservation Committee charged with assessing the preservation needs of the libraries. The Committee's report included a number of specific recommendations for action, including the appointment of a preservation officer to develop and implement a coordinated program for the preservation of the university's collection. The library began recruiting a preservation officer in 1984, and appointed Carla J. Montori, formerly of the Yale University Library Preservation Department, Head of the Preservation Department, to begin in November of that year. This position reports to both the Associate Dean for Technical Service and the Associate Dean for Collection Development and Management. The incumbent is a member of both the Fund Manager's Council (collection development) and the Technical Services Administrators. While this dual reporting responsibility means attending a lot of meetings, the preservation officer has a large group of peers, and is involved in a wide variety of library activities.

The Preservation Department is charged with broad responsibility for those activities affecting the physical integrity of library materials, to ensure their continued availability for use. In order to discharge these responsibilities, the department merged staff and activities performed by sections of other Technical Services departments. Preservation is currently comprised of the Bindery Preparations, Shelf Preparations, and Repair Sections, and has microfilming capability.

One of the preservation officer's first jobs was to rewrite the contract for commercial library binding services. Because the contract must meet the varying needs of all libraries in the multi-campus system, it must be flexible enough to fit a variety of local conditions. The wide range of binding options specified in the contract is designed to allow each campus to use commercially available binding services as a preservation tool tailored to that campus' unique needs. The university's contract is with the Heckman Bindery, Incorporated (HBI) of North Manchester, Indiana. The preservation officer works closely with HBI to administer the contract, and is a member of HBI's Customer Council, a forum for the exchange of ideas between HBI and its customers.

The Preservation Department's Bindery Prep Section is responsible for preparing Bloomington campus materials for treatment by HBI (48,000 volumes FY 85/86). The establishment of a new department under the management of a preservation administrator has fostered an environment in which the Bindery Prep staff can take increased responsibility for making binding decisions. This more assertive approach has positively affected the library's relationship with HBI. A close working relationship based on discussion of the library's needs and the binder's services has developed.

In 1983, Debra McKern, a graduate student at IU's School of Library and Information Science and the former Collections Maintenance Supervisor at Southern Illinois University/Carbondale, was hired to plan, equip, and staff a centralized repair unit as part of the Serials Department. Until that time, elementary repairs had been done by the stacks office of the Circulation Department, and by the branch libraries. At the time of its transfer to the Preservation Department, the repair unit was equipped with basic tools, equipment, and supplies; the staff was trained in a variety of repair techniques.



The recently completed conservation and book repair section. Photo: Carla J. Montori

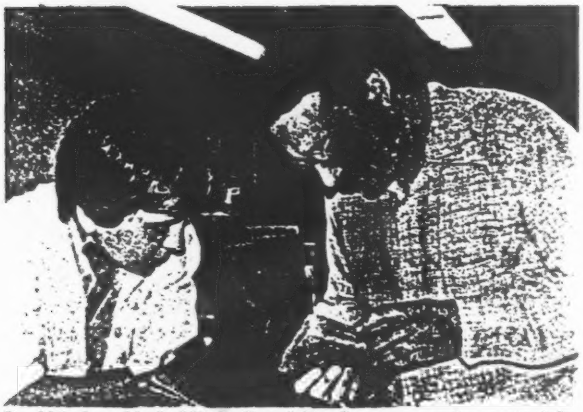
Early in 1985, the Repair Section was moved into a much larger space than it had previously occupied (from approximately five hundred square feet to thirty-five hundred square feet). This move allowed considerable expansion, both in terms of equipment and facilities, and in terms of services the section could offer to the library. In summer 1985, James R. Canary, a binder in private business in Bloomington who also worked part-time at the Lilly Library, was appointed head of the Repair Section. Income from the Libraries' NEH Challenge Grant for the acquisition and preservation of humanities materials was used to build work benches and other furnishings, and to purchase equipment for the section. There are five work stations, a box-making area, material supply stations, and plenty of additional storage space. The section is now equipped to perform such treatments as book repair and rebinding, box making, printing labels, and paper mending and encapsulation. It does not at this time have a purified water system, flat paper sink, or fume hood.

Repair is responsible for the maintenance of the Bloomington campus collections. Material is received from a variety of sources: from the subject specialists and branch librarians, who each have a quota of items s/he can send for treatment per week; from the Circulation Department; and from the Preservation Department's other sections. Repair staff also take on scheduled special projects, such as cleaning, mending, deacidifying, and encapsulating the library's collection of African political posters. All incoming material is examined by the section head, who determines the treatment it will receive.

Continued on page 26

The section depends heavily on student labor. Staff is currently the section head and 1.25 FTE student assistants. While the section has been lucky in recruiting — and keeping — talented student employees, the staffing configuration places an extra training and supervisory burden on the section head. Each student is trained in all repair techniques, starting with pamphlet binding and progressing through the more sophisticated book and paper repairs. The section head also trains branch library staff who have been assigned to do simple repair in the branches. By decentralizing the most basic repair functions, preservation staff can concentrate on material requiring more skill and training.

Preservation activities in the rare books and manuscript collections of the Lilly Library include monitoring environmental conditions in the stacks and exhibits areas as well as treatment of the collections. The Repair Section head spends one day per week at the Lilly Library conferring with the collection curators and the stack supervisor, assisting in delegating treatment activities, and performing item-specific treatments. In-house treatments include cleaning and mending paper, removing material from acidic mats and enclosures and constructing archivally-sound enclosures, book conservation treatments, and preparing materials for exhibition, microfilming, and patron use. Student employees and volunteers are carefully trained to perform treatments.



Bookbinders Linda Mitchell and Jim Canary examine materials. Photo: Carla J. Montori

Over the past year, the Preservation Department has made arrangements with the Fine Arts Museum to use the museum's paper conservation lab when necessary. This lab is equipped with filtered and de-ionized water, large sinks for washing paper, and a fume hood. Any deacidification the department undertakes is done in this lab. It is also helpful for Preservation Department staff to have the opportunity to talk with the paintings and objects conservators at the Fine Arts and Mathers Museums about materials and procedures.

The activities mentioned above — shelf prep, bindery prep, and repair — are the basis of the preservation program. All were being performed in at least one department before the establishment of the Preservation Department. While in some cases the Preservation staff's specific duties have remained the same, the focus of the department in which those duties are performed is quite different. In order to better carry out its responsibilities, the department must expand the services it provides to the library. The development of an active information preservation program to coordinate the replacement and reformatting of deteriorated materials is a high priority.

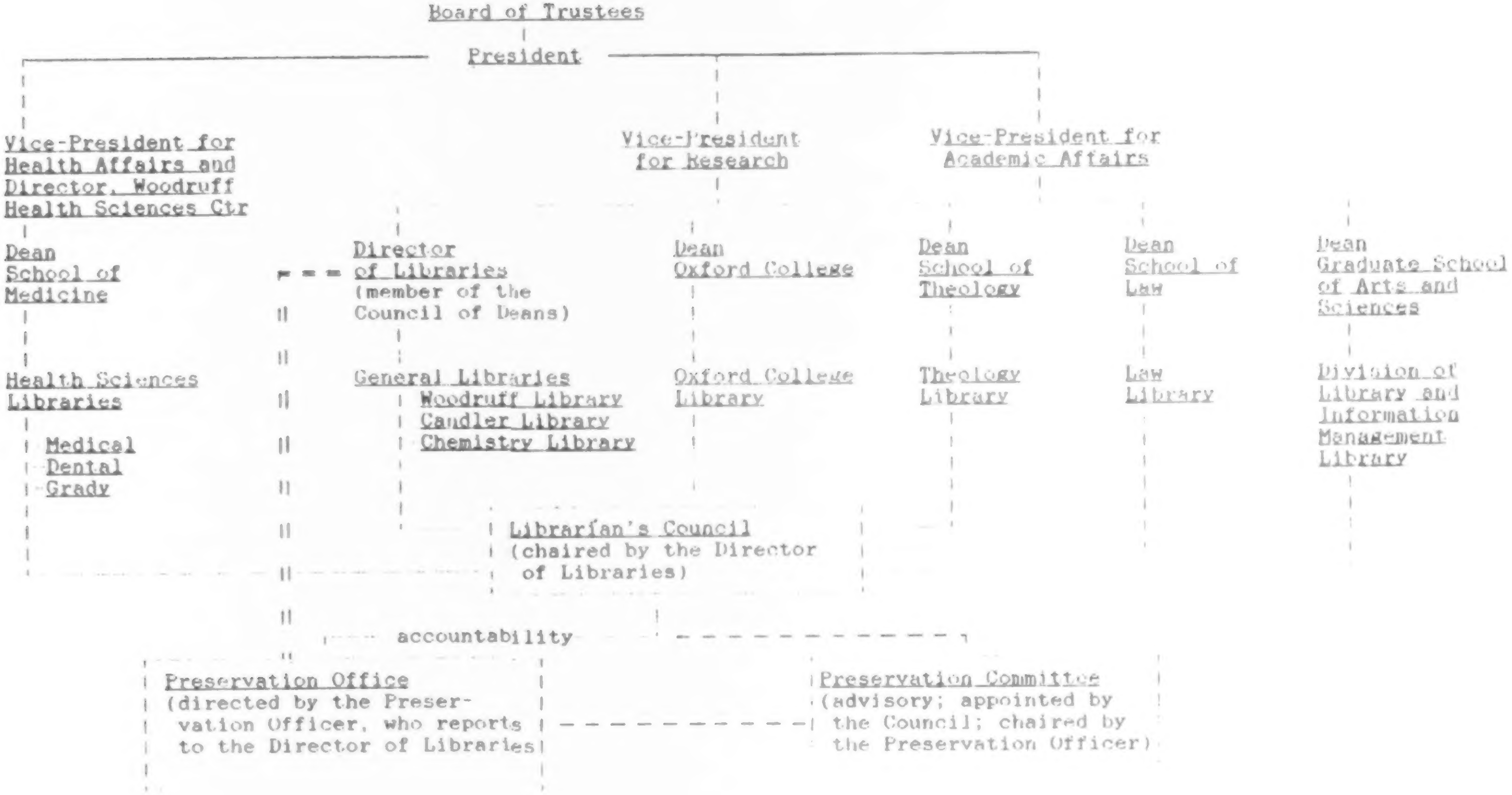
The library received a Title II-C grant for 1984 for the acquisition and cataloging of folklore material, and for microfilming brittle items in the Folklore Collection. The microfilming was done in the Serials Department; at the end of the grant period, responsibility for any future filming was assumed by the Preservation Department. An arrangement with an outside filming agent is being investigated, whereby brittle material from the general collections could be sent out to a contractor for filming, but whereby the contractor would send a skilled camera operator to the Preservation Department to use the library's equipment to film material in-house for the special collections.

The Preservation Department is increasingly active in staff and user education by conducting various workshops and tours, and mounting an exhibit on preservation at IU, in conjunction with the Preservation Committee. The department also serves as a technical resource for the university-wide library system, maintaining a reference collection of books and articles. Department staff copes with water-related emergencies throughout the libraries; the department head is revising and expanding the libraries' disaster plan.

Any preservation program is faced with a daunting array of complex issues. Indiana's Preservation Department enjoys the strong support of the library administration and of the libraries' faculty and staff. With this continuing support, the Preservation Department can maintain its momentum and meet the next in its series of challenges.

Carla J. Montori and James R. Canary
Indiana University

Organizational Context for Preservation
Emory Libraries
1985/86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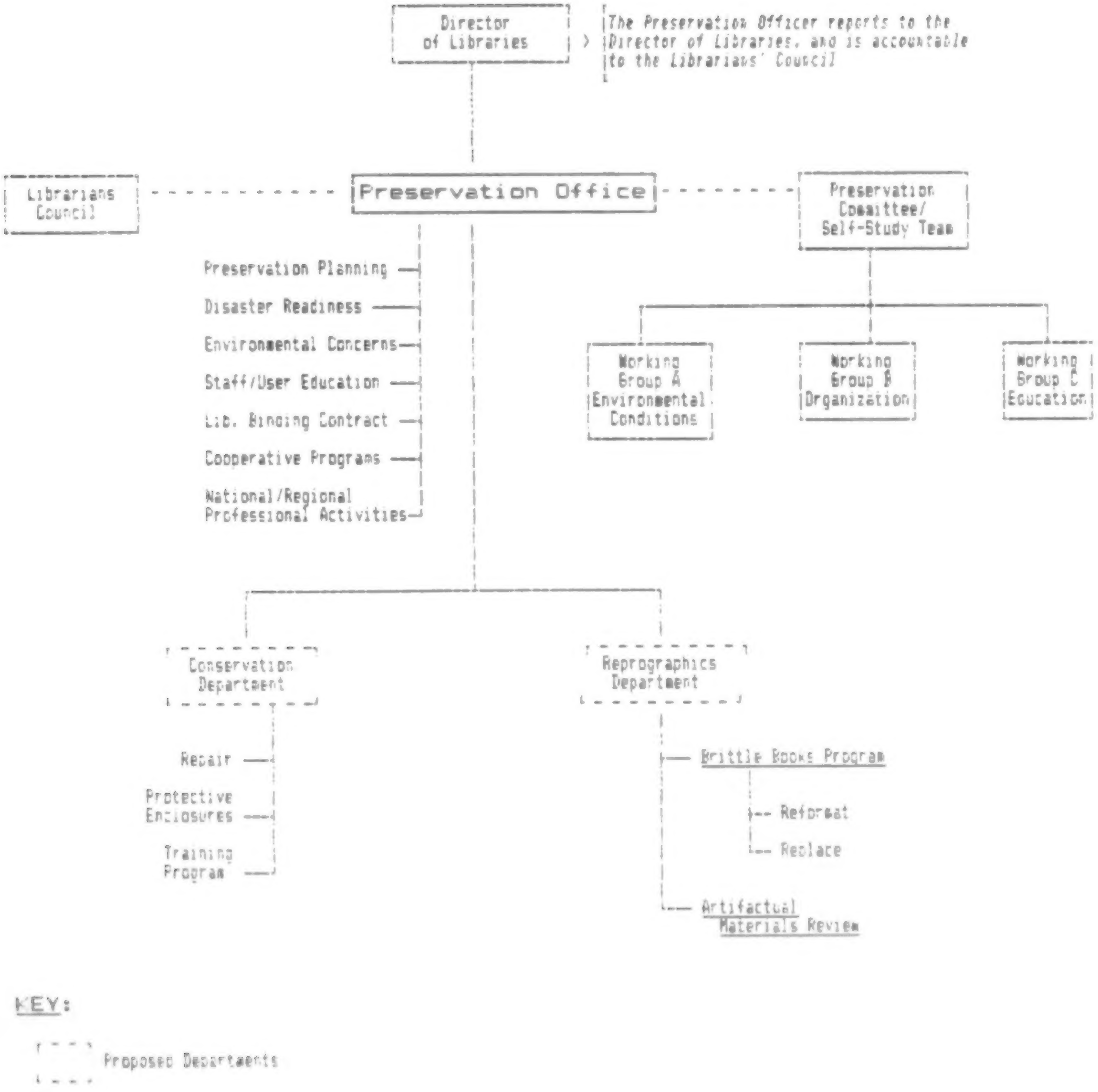
Dental
Grady
General Libraries
Woodruff Library
Candler Library
Chemistry Library
Oxford College Library
Theology Library
Law Library
Division of Library and Information Management Library
Librarian's Council (chaired by the Director of Libraries)
accountability
Preservation Office (directed by the Preservation Officer, who reports to the Director of Libraries)
Preservation Committee (advisory; appointed by the Council; chaired by the Preservation Officer)

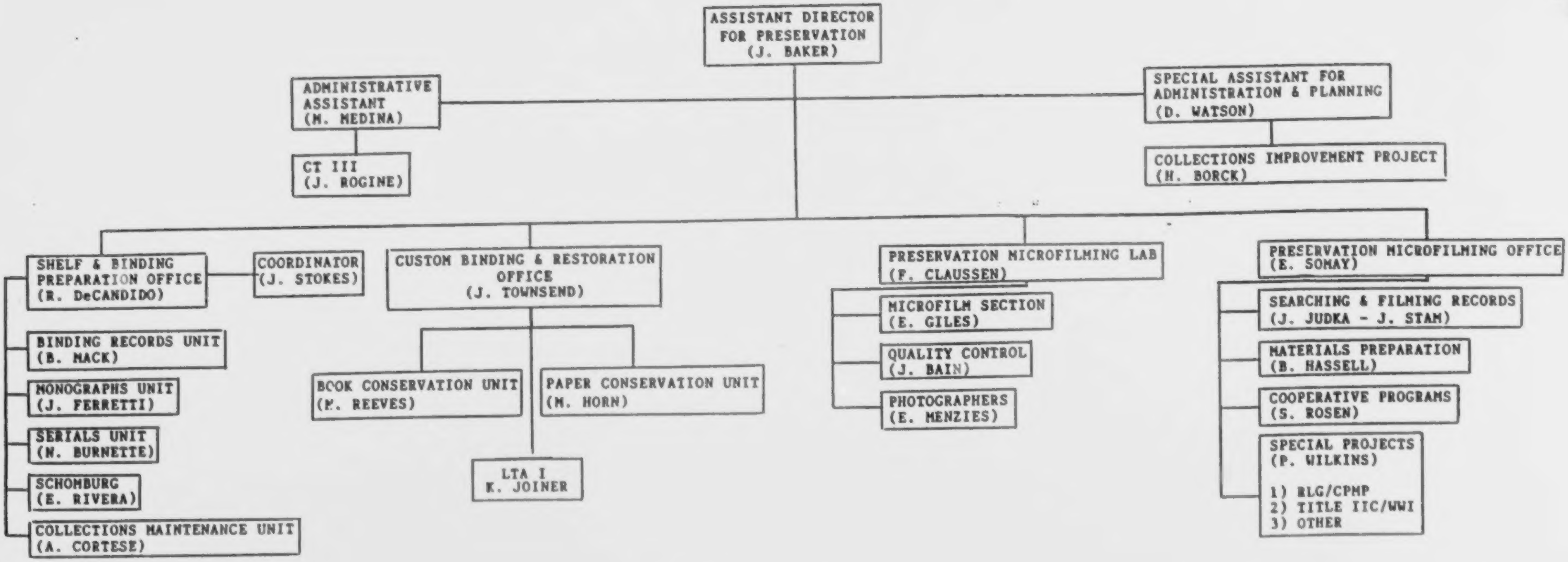
Chart 2

ORGANIZATION FOR PRESERVATION

Emory Libraries
1985/86


Director of Libraries
The Preservation Officer reports to the Director of Libraries, and is accountable to the Librarians' Council
Librarians Council
Preservation Office
Preservation Committee/ Self-Study Team
Preservation Planning
Disaster Readiness
Environmental Concerns
Staff/User Education
Lib. Binding Contract
Cooperative Programs
National/Regional Professional Activities
Working Group A Environmental Conditions
Working Group B Organization
Working Group C Education
Conservation Department
Repair
Protective Enclosures
Training Program
Reprographics Department
Brittle Books Program
Reformat
Replace
Artifactual Materials Review
KEY:
Proposed Departments

New York Public Library
Conservation Division


ASSISTANT DIRECTOR FOR PRESERVATION (J. BAKER)
ADMINISTRATIVE ASSISTANT (M. MEDINA)
CT III (J. ROGINE)
SPECIAL ASSISTANT FOR ADMINISTRATION & PLANNING (D. WATSON)
COLLECTIONS IMPROVEMENT PROJECT (H. BORCK)
SHELF & BINDING PREPARATION OFFICE (R. DeCANDIDO)
COORDINATOR (J. STOKES)
BINDING RECORDS UNIT (B. MACK)
MONOGRAPHS UNIT (J. FERRETTI)
SERIALS UNIT (N. BURNETTE)
SCHOMBURG (E. RIVERA)
COLLECTIONS MAINTENANCE UNIT (A. CORTESE)
CUSTOM BINDING & RESTORATION OFFICE (J. TOWNSEND)
BOOK CONSERVATION UNIT (K. REEVES)
PAPER CONSERVATION UNIT (M. HORN)
LTA I K. JOINER
PRESERVATION MICROFILMING LAB (F. CLAUSSEN)
MICROFILM SECTION (E. GILES)
QUALITY CONTROL (J. BAIN)
PHOTOGRAPHERS (E. MENZIES)
PRESERVATION MICROFILMING OFFICE (E. SOMAY)
SEARCHING & FILMING RECORDS (J. JUDKA - J. STAM)
MATERIALS PREPARATION (B. HASSELL)
COOPERATIVE PROGRAMS (S. ROSEN)
SPECIAL PROJECTS (P. WILKINS)
1) RLG/CPMP
2) TITLE IIC/WWI
3) OTHER

JANUARY 1987

CUSTOM BINDING AND RESTORATION OFFICE

FACT SHEET

The Custom Binding and Restoration Office (CBRO) provides physical preservation treatment to materials in The Research Libraries that have been selected for retention in their original formats.

MATERIALS TREATED

--Rare books and objects in non-book formats

RESPONSIBILITIES

--Rebinding and repair of bindings
--Matting and encapsulation
--Paper cleaning and repair
--Chemical stabilization (deacidification)
--Creation of acid-free boxes
--Partial support of exhibitions program
--Recovery of water-damaged materials
--Inspection of insect-infested materials
--Coordination of disaster recovery planning

SELECTION PROCESS

--Division Chiefs
--Curators
--Conservation representatives in public service divisions
--CBRO supervisory staff

TREATMENT TIME ALLOCATION

--1,350 treatment hours per month
--Point/Quota system for allocation of production time to divisions

PRODUCTION (1986)

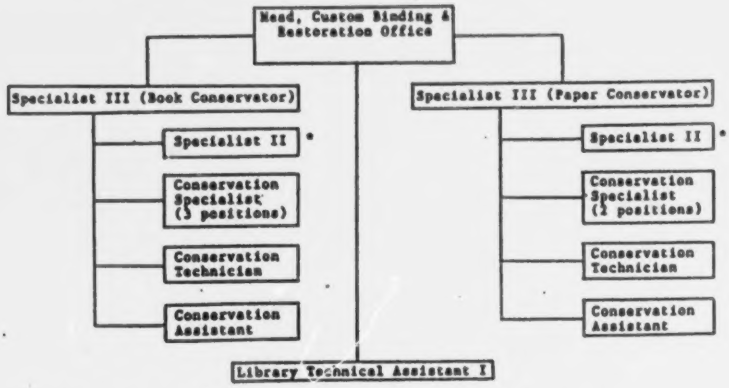
-- 850 objects in various formats

STAFF

--Professional: 3
--Technicians: 10

SALARY AND FRINGE BENEFITS (1986): $362,000.00

ORGANIZATION CHART


Head, Custom Binding & Restoration Office
Specialist III (Book Conservator)
Specialist II *
Conservation Specialist (3 positions)
Conservation Technician
Conservation Assistant
Specialist III (Paper Conservator)
Specialist II *
Conservation Specialist (2 positions)
Conservation Technician
Conservation Assistant
Library Technical Assistant I

*Positions to be added

OTHER ACTIVITIES

--Staff training and orientation
--Practical research in treatment methods and techniques
--Responds to queries from Library staff on many aspects of conservation/preservation
--Provides the Library with trained recovery team in time of disaster

The New York Public Library
Conservation Division

June 1986

PHOTOGRAPHIC LABORATORY

FACT SHEET

The Photographic Laboratory (PL), a unit of the Conservation Division, films or photographs materials received from the Preservation Microfilming Office and public orders received by Reprographic Services. It creates archival microfilm masters as well as direct image (DI) negatives, microfiche, positive service copies of microforms, and photographic negatives and prints.

FUNCTIONS OF THE LABORATORY

--Microfilms and microfiches assigned materials
--Creates DI negatives and positive microforms
--Processes and/or prints films and photographs
--Provides quality control for all filming
--Fulfills public order microform requests
--Fulfills public order photographic requests

MATERIALS FILMED

--Manuscripts, printed works, maps, scrapbooks
--Newspapers, gazettes, serials

MATERIALS PHOTOGRAPHED

--Manuscripts, printed works, maps
--Newspapers, gazettes
--Photographs

PRODUCTION (1985-1986)

--Reels of microfilm: 2,370
--Exposures (frames): 2,000,000
--Volumes filmed: 14,200
--Exposures (frames) public request microfilm: 230,442
--Public orders for photography: 1,830
--Public orders for microforms: 1,218

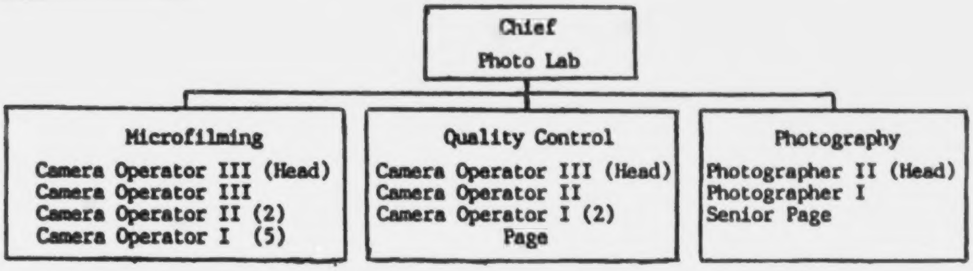
STAFF

--Administrative: 1
--Camera Operators: 13
--Photographers: 2
--Pages: 2

SALARY AND FRINGE BENEFITS (1986): $409,000.00

FILM AND PHOTOGRAPHIC SUPPLIES: $70,000.00

ORGANIZATION CHART


Chief
Photo Lab
Microfilming
Camera Operator III (Head)
Camera Operator III
Camera Operator II (2)
Camera Operator I (5)
Quality Control
Camera Operator III (Head)
Camera Operator II
Camera Operator I (2)
Page
Photography
Photographer II (Head)
Photographer I
Senior Page

A new photographic laboratory is under construction on the basement level of the Central Research Building. This facility provides microfilming and microficheing areas, a quality control laboratory, a photographic studio, processing, developing, and drying rooms, and a laboratory for testing processed film. New equipment utilizing the latest technology will enable the Photographic Laboratory to maintain its high standards, production rate, and increase its efficiency. A completion date of January 1987 is anticipated.

The New York Public Library

Conservation Division

September 1986

PRESERVATION MICROFILMING OFFICE

FACT SHEET

The Preservation Microfilming Office (PMO) manages the microfilming program. It is responsible for receiving and processing materials in The Research Libraries which have been identified as best retained in an archival microform format.

FUNCTIONS OF THE OFFICE

- --Searches bibliographic data bases to avoid duplication of filming
- --Updates master negative holdings records
- --Fulfills public order microform requests
- --Reports filming decisions to RLIN
- --Physical preparation of materials for filming by the Photo Lab
- --Manages a quota system for allocation of production time to public divisions

MATERIALS FILMED

- --Manuscripts
- --Retrospective printed works
- --Current publications on low grade paper
- --Newspapers and gazettes
- --Polemical and controversial materials that present a security risk

SELECTION PROCESS

- --Division Chiefs
- --Curators
- --Conservation representatives in public service divisions
- --PMO supervisory staff

PRODUCTION

- --2,370 reels
- --2,000,000 exposures
- --14,200 volumes filmed
- --230,442 exposures of public requests filmed

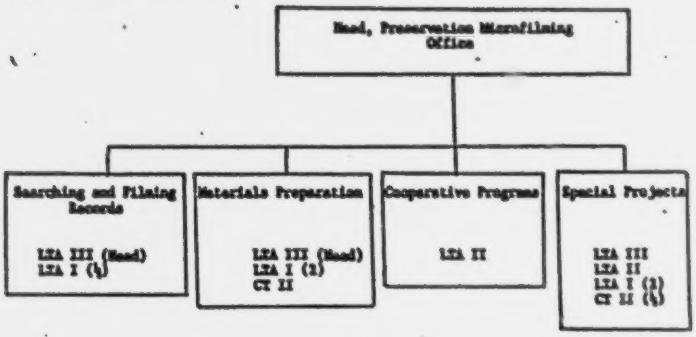
SIZE OF MASTER NEGATIVE MICROFORM COLLECTION: 151,000 reels

STAFF

- --Professional: 1
- --Technicians: 16

SALARY AND FRINGE BENEFITS (1986): $471,000.00

ORGANIZATION CHART


Head, Preservation Microfilming Office
Searching and Filming Records
LTA III (Head)
LTA I (½)
Materials Preparation
LTA III (Head)
LTA I (2)
CT II
Cooperative Programs
LTA II
Special Projects
LTA III
LTA II
LTA I (2)
CT II (½)

OTHER ACTIVITIES

- --Cooperative projects with other institutions and micropublishers
- --Practical research and evaluation of procedures
- --Participation in professional organizations

The New York Public Library — June 1986

Conservation Division

SHELF AND BINDING PREPARATION OFFICE

FACT SHEET

The Shelf and Binding Preparation Office (SBPO) evaluates and prescribes the binding treatment of all monographs and serials added to the general collection and provides rebinding and repair service for non-rare books in the cataloged stack collections.

FUNCTIONS OF THE OFFICE

--First-time binding
--Rebinding and preservation cases
--Labeling and shelf preparation
--Simple repairs

MATERIALS TREATED

--All new book materials (except Special Collections)
--Stack materials in need of rebinding or repair

SELECTION PROCESS

--New materials from Cataloging Division
--General collection materials by divisional monthly quota

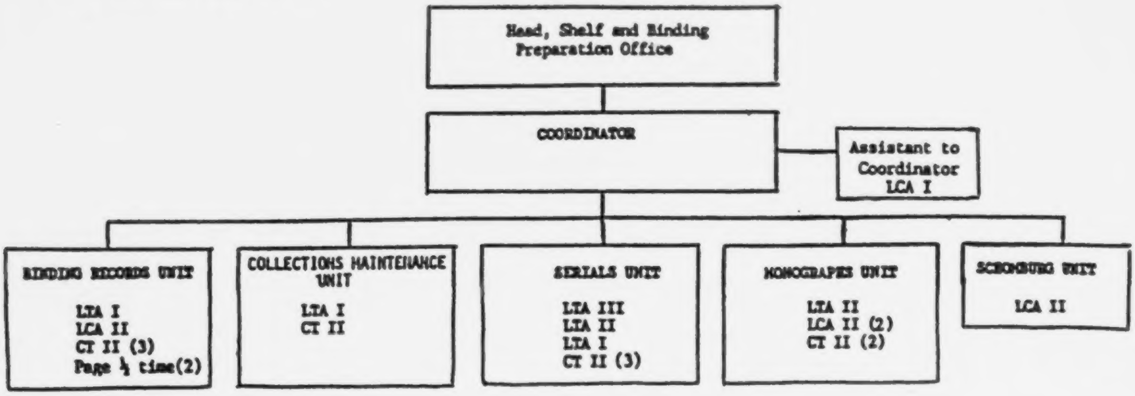
PRODUCTION (1986)

--39,162 volumes sent for first-time binding
-- 1,370 volumes rebound
-- 2,161 volumes repaired
-- 4,624 volumes placed in preservation cases
--40,413 volumes labeled and prepared for shelving

STAFF

--Professional: 1
--Technicians: 20
--Pages: 2

ORGANIZATION CHART


Head, Shelf and Binding Preparation Office
COORDINATOR
Assistant to Coordinator LCA I
BINDING RECORDS UNIT
LTA I
LCA II
CT II (3)
Page ½ time(2)
COLLECTIONS MAINTENANCE UNIT
LTA I
CT II
SERIALS UNIT
LTA III
LTA II
LTA I
CT II (3)
MONOGRAPHS UNIT
LTA II
LCA II (2)
CT II (2)
SCHOMBURG UNIT
LCA II

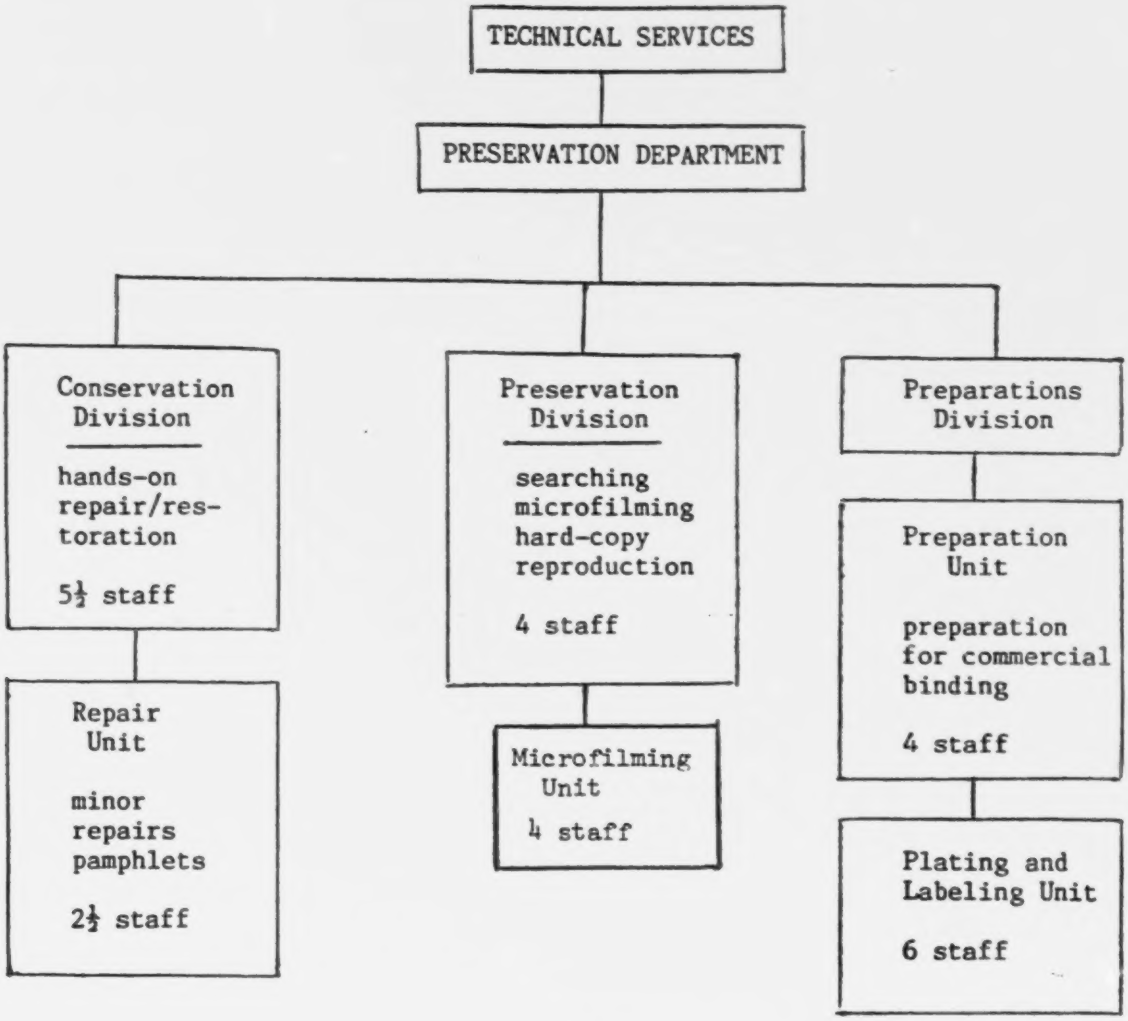
OTHER ACTIVITIES

--Collections surveys
--Environmental monitoring
--Participation in professional organizations

The New York Public Library
Conservation Division

June 1986

ORGANIZATION CHART FOR PRESERVATION
Yale University Library


TECHNICAL SERVICES
PRESERVATION DEPARTMENT
Conservation Division
hands-on repair/restoration
5½ staff
Repair Unit
minor repairs pamphlets
2½ staff
Preservation Division
searching microfilming hard-copy reproduction
4 staff
Microfilming Unit
4 staff
Preparations Division
Preparation Unit
preparation for commercial binding
4 staff
Plating and Labeling Unit
6 staff

388

as of 4/86

Section 6: Disaster Prevention and Preparedness

A: ARCHITECTURE

A1) Type of primary building material (brick, concrete, etc.) ______

____

A2) Foundation: visible water stains? yes___ no___ If yes, describe location and extent of stains ______________________

____

cracks? yes___ no___ If yes, describe location and extent of

____

____

are collections stored in basement areas? yes___ no___

seepage into basement areas? yes___ no___ If yes, describe location and extent of seepage______________________

____

______________________most recent problem (describe any damage and give date of occurrence)______________

____

A3) Roof: type of building material______________________

flat roof? yes___ no___ skylights? yes___ no___

drains/eaves? yes___ no___ condition?______________

____

evidence of leakage through ceilings? yes___ no___ where?______

____

most recent leak? (date)______________________________ extent of damage to collections______________________________

____

____

A4) Do you experience ongoing problems related to the building structure not mentioned above? yes___ no___ If yes, please describe____

____

____

____

B: HEATING AND COOLING SYSTEMS

B1) Describe the heating system (steam, forced air, etc.) in your building________________________________

How often does it undergo routine maintenance?________________

____

Are there chronic problems related to the heating system? (e.g., (chronic dryness/dampness, frequent breakdowns) yes___ no___

If yes, please explain________________________________

____

____

____

____

B2) Does your building have its own cooling system? yes___ no___

Describe the system (forced air, water-cooled, etc.)____________

____

How often does it undergo routine maintenance?________________

____

Are there any chronic problems related to the cooling system? (leaking or sweating registers, excessive dryness/dampness, etc.)

yes___ no___ If yes, please explain________________________

____

____

____

____

B3) Have you experienced excessive dampness leading to mold? yes___ no___ If yes, please explain, giving date of occurrence and location of affected materials at the time of the problem_______

____

____

____

____

B4) Have you had problems as a result of not having a cooling system such as (heavy deposits of dirt on materials due to open windows or leaves of books sticking together due to moisture absorbed by the paper, etc)? yes___ no___ If yes, please give examples_____

____

____

____

____

C: WATER

C1) Have there been any recent problems related to the plumbing in your building? yes___ no___ If yes, please explain, giving location(s) and date(s) of occurrence(s)______________________

____

____

____

C2) Have you ever experienced leakage around windows, skylights, ceilings, or doors after rain or snow? yes___ no___ If yes, please explain, giving dates and locations of occurrences______

____

____

____

____

____

C3) Are there water pipes running through collection areas? yes___ no___ Have you ever experienced leaks attributable to those pipes? yes___ no___ If yes, please explain, giving dates and locations of occurrences, and describing any damage to collections resulting from the leaks_______________________

____

____

____

D: SECURITY

D1) Does your building have any of the following?	yes	no
Burglar Alarm(s)	_____	_____
Fire Alarms	_____	_____
Heat Sensors	_____	_____
Smoke Sensors	_____	_____
Automatic Extinguishing System	_____	_____
Portable Extinguisher(s)	_____	_____

D2) Are staff aware of the type of systems in your building?

yes___ no___

D3) Are they aware of locations for all portable extinguishers?

yes___ no___

D4) Is the staff trained in the use of portable extinguishers?

yes___ no___

D5) Can all staff gain entry to the building after-hours?

yes___ no___

D6) Are master keys issued to staff as a matter of course?

yes___ no___

D7) Do you have an evacuation plan for staff and patrons?

yes___ no___

D8) Do you conduct regular fire drills?

yes___ no___

E: FIRE HAZARDS

E1) Have you previously had electrical problems in your library (smoking outlets, "browning" or power surges)? yes___ no___

If yes, please explain____

____

____

____

Did any of the problems result in an electrical fire?

yes___ no___ Date of occurrence______________________________

Were library materials affected? yes___ no___ To what extent?

____

____

Do you have an adequate number of outlets for your needs?

yes___ no___ If no, how do you cope with the situation? _______

____

____

____

E2) Do you have dependably regular trash collection within your library? yes___ no___

How often are wastebaskets emptied? _________________________

How often is you library's dumpster emptied? ________________

Are there areas inside you unit where trash builds up before collection? yes___ no___ Where?________________________________

How much? ____

E3) Are flammable materials used in your building? yes___ no___

What kinds? ____

____

How and where are they stored? ______________________________

____

How and how often are they disposed of? ______________________

____

E4) Do you have a bookdrop built-into an exterior wall? yes___ no___

Have you ever had flammable materials dropped into it? (please explain)____

____

Any other type of vandalism of the drop?______________________

____

____

PLANNING FOR DISASTER

F1) Do you have up-to-date floor plans for your building?

yes___ no___ If yes, are they clearly marked with locations of:

	yes	no
fire extinguishers?	_____	_____
fire alarms?	_____	_____
emergency exits?	_____	_____
telephones?	_____	_____
master switches for electricity?	_____	_____
water main shut-off?	_____	_____

F2) Do you have a staff/patron evacuation plan? yes___ no___ Is it up-to-date? yes___ no___ Are all staff aware of their roles in the event of a fire, bomb threat or other emergency? yes___ no___ Are floor plans with emergency exit routes posted in public areas of your library?

F3) Do any of your stack ranges sit directly next to an interior wall? yes___ no___ Do books or other materials rest within 2" of that wall? yes___ no___ If yes, please identify location and give an estimate of the numbers of volumes involved ________

____

____

F4) Do any of your stack ranges sit directly next to an exterior wall? yes___ no___ Do books or other materials rest within 12" of that wall? yes___ no___ If yes, please identify location and give an estimate of the number of volumes involved ________

____

____

F5) Do you have any works of art or other materials hung on exterior walls? yes___ no___ If yes, please identify location and give an estimate of the numbers and types of items involved ________

____

____

____

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BASIC GUIDELINES FOR DISASTER PLANNING IN OKLAHOMA

prepared by

Toby Murray

University of Tulsa Preservation Officer
and
Chair, Disaster Preparedness Committee of the
Oklahoma Conservation Congress

October 1986

BASIC GUIDELINES FOR DISASTER PLANNING IN OKLAHOMA

Disasters have not been known to inquire about one's state of readiness before striking. Knowing what (and what not) to do before, during, and after a disaster will prevent panic, lessen the severity of damage, and enable you to implement an organized recovery operation after the dust settles, the smoke dissipates, and the water subsides.

The following guidelines are offered to assist you in the preparation of a disaster plan and the organization of salvage procedures for your own institution. They should be tailored to fit your institution's needs and idiosyncrasies. Members of the in-house recovery team should receive two copies of the plan -- one to keep at work and one to keep at home. The plan should be reviewed and updated at least twice a year.

All staff members should read and have access to your disaster plan. Training in disaster recovery techniques should be available to all staff members and mandatory for those individuals serving on your recovery team. This training is available from the Oklahoma Conservation Congress (OCC) and from the Oklahoma Disaster Recovery Assistance Team (O-DRAT). Information concerning these organizations may be obtained from the Archives and Records Division, Oklahoma Department of Libraries, 200 North East 18th, Oklahoma City, OK, 73105; (405) 521-2502. A copy of the disaster plan should be sent to the Archives and Records Division of the Oklahoma Department of Libraries (ODL) to facilitate the work of the members of O-DRAT, in the event their services are requested.

A minimum of five individuals should comprise the in-house disaster recovery team. Each should have an alternate. Their responsibilities should be as follows:

1. Team Leader: Overall management of salvage operation; coordination with administrative offices and media; budget allocation for wages, supplies, transportation, and services; public relations.

2. Assemble and coordinate work crews, control work and materials flow.

3. Record/inventory control of damaged materials.

4. Damage/salvage assessment, coordinate recovery effort, train work crews.

5. Assemble supplies and equipment, provide food for work crews, photograph damage and recovery operation.

DISASTER PREVENTION

Man-made disasters can often be prevented by routine inspections of a facility. Temperature and humidity should, ideally, be maintained at a constant 68o F and 50% RH. Cleaning and spraying for insects and rodents should be performed on a regular basis. Materials should be properly stored and protected from dirt, dust, and light. Ultra-violet filters should be placed over fluorescent lights and on windows. Leaky pipes, frayed electrical wires, untended machinery, open windows, and structural damage can result in unnecessary destruction of materials and possible loss of life. Aisles and work areas should be kept free of unprocessed materials and trash.

Machinery should be unplugged when not in use. Rules regarding food, beverages, smoking, and unauthorized access should be established and enforced. Security checks should be made at closing time to ensure all exits and windows are locked, all equipment has been turned off or unplugged, all lights and water faucets are off, no cigarettes are smoldering in ashtrays or wastebaskets, and no unauthorized personnel are in the building. Consult Barton and Wellheiser, An Ounce of Prevention: A Handbook on Disaster Contingency Planning for Archives, Libraries and Record Centres (see page 10 for bibliographic citation) for additional information and instructions.

Disasters do not appear out of nowhere. Be aware of all hazards (situations that have the potential for causing damage) and correct them before they develop into disasters. Staff members should all be familiar with the layout of the building and of possible danger areas. They should know the location of all fire extinguishers and alarms and how to operate them. Fire exits and alternate escape routes should be clearly marked. Evacuation procedures should be established and practiced regularly.

Be aware, too, of hazards that may exist in the community that could affect your facility. If your building has been designated an evacuation center by city officials, determine the chain of command and whether you or the city will be responsible for security.

All sources of supplies and services should be contacted in advance to explain your needs and purpose. Sources should be contacted on a regular basis to determine whether those supplies and services are still available and to remind them of their commitment. Keep in mind that in a wide-scale, major disaster, your sources may not be available because they have their own damages with which to deal or because they are assisting someone else. In addition, outside help probably will not be available for one or two weeks. It is recommended that you keep as many recovery materials as possible on-site.

DISASTER PLAN FORM

I. Name of institution____

II. Date of completion or update of this form________________

III. Staff members to be called in the event of a disaster

Position	Name	Telephone Number Home	Telephone Number Office
Chief library administrator			
Individual in charge of building maintenance			
Preservation administrator or conservator			
In-house disaster recovery team members			

Note below who is to call whom upon the discovery of a disaster ("telephone tree")

IV. Off-site services to be called (if needed) in the event of a disaster

Service	Name of contact	Telephone number
Fire Department		
Police Department		
Ambulance		
Civil Defense		
Insurance company		
Legal advisor		
Utility companies		
Electrician		
Plumber		
Carpenter		
Exterminator		
Chemist		
Mycologist		
Locksmith		
Janitorial service		
Individuals and/or organizations to assist in clean-up		
O-DRAT	Howard Lowell	1-800-522-8116

V. Upkeep Checklist

A. Daily Procedures

Locks on doors and windows secure and all keys accounted for

No pipes, faucets, toilets, or air-conditioning units leaking

Electrical equipment unplugged and no frayed wiring in evidence

No signs of structural damage

No burning materials in ashtrays and wastebaskets

B. Periodic Procedures

B. Periodic Procedures	Date checked
Emergency numbers are accurate and posted near every telephone	____________
Most recent inspection by fire department	____________
Fire extinguishers operable	____________
Smoke alarms operable	____________
Sprinkler system operable	____________
Water detectors operable	____________
Halon system operable	____________
Public address system operable	____________
Operable flashlights placed in every department and Civil Defense shelter	____________
Transistor radio operable	____________
Staff familiarized (by tour, not map) with locations of fire extinguishers, flashlights, radio, Civil Defense shelter, and how to reach members of the in-house disaster recovery team	____________
Most recent fire drill	____________
Most recent civil defense drill	____________

Most recent tornado drill ____________

Most recent inventory (see IX, page 9) ____________

Current insurance policy (copy attached) ____________

Completed copy of "Fire and Insurance Protection of Library Resources -- Questionnaire" from Protecting the Library and Its Resources, Chicago: ALA, 1963 (copy attached) ____________

VI. Locations of in-house emergency equipment (attach map or floor plan with locations marked and labeled)

CB radio ____________

Cut-off switches and valves:

Electric ____________

Gas ____________

Water ____________

Sprinkler system (if separate) ____________

Disaster boxes ____________

Fans ____________

Fire alarms ____________

Fire extinguishers ____________

First aid kits ____________

Flashlights ____________

Freezer or wax paper ____________

Fungicides ____________

Heavy-duty extension cords ____________

Mops ____________

Nylon monofilament ____________

Paper towel supply ____________

Plastic milk crates ____________

Plastic sheeting ________________

Plastic trash bags ________________

Portable generator ________________

Rubber gloves ________________

Safety helmets (hard hats) ________________

Smoke alarms ________________

Sponges, pails, brooms ________________

Sump pump or portable pump ________________

Transistor radio ________________

Unprinted newsprint ________________

Water detectors ________________

Water hoses ________________

Waterproof clothing ________________

Wet-dry vacuum ________________

Date members of in-house disaster recovery team toured all locations noted above ________________

VII. Sources of off-site equipment and supplies

Item	Contact/Company	Telephone number
Deep freeze facilities		
Dehumidifiers		
Drying space		
Extra security personnel		
Fans		
Fork lift		
Library trucks		
Pallets		

Plastic milk crates ____________________

Plastic sheeting ____________________

Portable generator ____________________

Portable sump pump ____________________

Refrigerator trucks ____________________

Unprinted newsprint ____________________

Wet-dry vacuums ____________________

VIII. List all locations where this plan and follow-up reports are on file

Date filed

A. In-house: ____________________

B. Off-site: ____________________

C. O-DRAT: ____________________

IX. Inventory/Priority lists

Attach hereto, for each department, office, and area, lists of all materials located therein, showing priority for salvage should a disaster occur. To simplify this procedure, assign priorities as follows:

#1 - Salvage at all costs

#2 - Salvage if time permits

#3 - Salvage as part of general clean-up

The following questions may be helpful in determining priorities:

A. Can the item be replaced? At what cost?

B. Would the cost of replacement be less or more than restoration of the item?

C. How important is the item to the collection?

D. Is the item available elsewhere?

Perhaps the highest priority should be given to bibliographic controls of your collection, such as card catalogues, shelf lists, accession records, inventories, and finding aids. It is strongly recommended that duplicate copies of these controls be kept off-site.

Specific collections or areas will most likely be second on your priority list. Staff should know, for example, to salvage historical documents, original paintings, and rare books before the National Geographic and Reader's Digest.

X. Procedures

Attach hereto a list of specific procedures to be followed in the event of a disaster in your institution, including responsibilities of in-house recovery team members and work crews.

See "Salvage Procedures for Water-Damaged Materials" on pages 13-23. Sources of additional information may be found in the appended bibliography. The following publications are highly recommended:

Anderson, Hazel and John E. McIntyre. Planning Manual for Disaster Control in Scottish Libraries & Record Offices. Edinburgh: National Library of

Scotland, 1985. Available for £4 from The National Library of Scotland, George IV Bridge, Edinburgh EH1 1EW, Scotland.

Barton, John P. and Johanna G. Wellheiser. *An Ounce of Prevention: A Handbook on Disaster Contingency Planning for Archives, Libraries and Record Centres*. Ontario: Toronto Area Archivists Group Education Foundation, 1985. Available for $17.95 (plus $1.75 postage and handling) from Toronto Area Archivists Group, Post Office Box 97, Station F, Toronto, Ontario M4Y 2L4, Canada.

XI. Follow-up assessment

A written report, including photographs, should be prepared after recovery and attached to all copies of the disaster plan. A copy should also be submitted to ODL/O-DRAT. The report should note the effectiveness of the plan and include evaluations of all sources of supplies and equipment and all off-site facilities used.

DISASTER RECOVERY

If a disaster strikes when the building is occupied, your first concern should be for the safety of the individuals inside. Escape routes, alternate routes, and procedures for evacuating the building should be clear to all personnel and visitors. Practice drills should be conducted on a regular basis to eliminate panic during "the real thing." Drills should be timed. Individuals should be assigned the task of determining whether the building has been completely evacuated.

Most disasters tend to occur when the building is unoccupied -- during the early morning hours, on weekends, or during holiday closings. In the event of a major disaster, do not enter the building until it has been declared safe to do so by the Fire Marshal or by Civil Defense personnel.

Ninety-five percent of all disasters will result in water-damaged materials. Keep in mind that mold will develop within forty-eight to seventy-two hours in a warm, humid environment. You must work quickly to salvage damaged materials and to prevent additional damage from occurring.

The following steps are recommended for an effective recovery operation:

I. Assess the damage

How much damage has occurred? What kind of damage is it (fire, smoke, soot, clean water, dirty water, heat, humidity)? Is it confined to one area or is the entire building damaged? How much of the collection has been affected? What types of materials have been damaged (books, documents, microforms, photographs, computer tapes)? Are the damaged items easily replaced or are they irreplaceable? Can they be salvaged by the in-house recovery team, or will outside help be required?

Walk through the entire area and take extensive notes (use a pencil, as ink will run!). Photographs should be taken to document the damages. Contacts should be made at this time with the insurance carrier, sources of supplies and services, and the Oklahoma Disaster Recovery Assistance Team (if necessary).

II. Stabilize the environment

The environment must be stabilized to prevent the growth of mold. Ideal conditions for a recovery operation are 65 °F and 50% RH.

The following equipment should be readily accessible to help stabilize the environment:

A. Portable generators, in case a power failure occurs

B. Pumps, to remove large quantities of standing water

C. Fans, to circulate the air

D. Thermometers, hygrometers, hygrothermographs and/or sling psychrometers, to measure the temperature and humidity

Dehumidifiers can help to lower the humidity, although they usually are only effective in small, enclosed areas, and tend to increase the temperature in a room. They can also freeze up in the lower temperatures required for salvage and recovery operations. Raising the temperature will not lower the humidity -- it will only accelerate mold growth. Temperature and humidity should be monitored constantly.

The air should be circulated in the damaged area. This may be accomplished by running fans constantly. If possible, they should expel the humid air from the area. Any standing water should be pumped from the area. Extreme caution must be taken, as standing water can conceal hazards.

III. Activate the in-house disaster recovery team

Organize work crews and be sure their responsibilities are clearly defined. No salvage activity should begin until a plan of action has been determined by the team leader. Disaster and recovery areas should be inaccessible to the public.

Frequent rest breaks should be provided for workers. Food and/or beverages should be available.

IV. Restore the area

After the damaged items have been removed and the environment has been stabilized, the area must be thoroughly cleaned. Walls, floors, ceilings, and all furniture and equipment must be scrubbed with soap and water and a fungicide. Carpeting, and especially the padding under it, should be carefully examined, as mold will develop rapidly. Removal of smoke odor and fogging with fungicides or insecticides should be performed only by professionals.

SALVAGE PROCEDURES FOR WATER-DAMAGED MATERIALS

A number of options are available for treating water-damaged materials. The choice of treatment will depend upon the extent and type of damage incurred, and the manpower, expertise, and facilities available.

I. Vacuum freeze drying

Vacuum freeze drying is the safest and most successful method, although it is also the most expensive. Materials must be frozen when they are placed in a sublimation chamber. This type of chamber operates under high vacuum and high heat, and turns the ice crystals in and on the frozen materials to water vapor. The vapor is then collected on a cold panel that has been chilled to at least -200° F, so it cannot go back on the materials. If they are not frozen when they are put in the chamber, the materials will freeze on the outside and the water molecules on the inside will be forced through the frozen barrier as the vacuum is pulled. This action can cause the book or document to "explode."

When materials are removed from the vacuum freeze chamber, they will be very dry and should acclimate for at least one month before they are opened to avoid cracking the spine and/or binding (this is especially true for leather bindings). They may be placed in a high humidity room to accelerate the acclimation process, but must be monitored closely for signs of mold.

Materials so treated will not look like new, but will show signs of swelling and distortion. Stanford University Library staff members reported they needed an additional twelve percent of shelf space for materials that had been treated in Lockheed's chamber. Photographs will not be damaged by this treatment, but rubber cement will dissolve and stain the pages to which it has been applied.

The closest vacuum freeze dry facility is at McDonnell Douglas in St. Louis. Two chambers are available: the smaller one is 5.5'x6'and will hold fifteen plastic milk crates; the larger chamber is 14'x14'x35' and will hold a semi-trailer load of crates. The most recent price quote was $2,000 for the smaller chamber and $14,000 for the larger one. The entire process takes about two weeks. Information and current costs may be obtained from Ben Bull, Document Reclamation Service, McDonnell Aircraft Company, Department 256, Building 102, Post L140, Post Office Box 516, St. Louis, MO 63166; (314) 234-9121.

II. Vacuum drying involves the placement of wet materials in a chamber that pulls the moisture by means of a vacuum. This method is not recommended as the heat involved is damaging to paper (especially bound paper) and photographic materials. Microwave ovens should not be used for the same reason.

III. Freezing

Freezing wet materials will stabilize them and provide you with time to determine your course of action. Mold will not grow and further deterioration from water will not occur when materials are in a frozen state. Books have been left in a freezer for ten years and successfully thawed and air-dried with no resultant damage. Freezing will also help to eliminate smoke odor from materials.

Rapid freezing is recommended to minimize damage from ice crystals (the faster the materials are frozen, the smaller the ice crystals will be). Temperatures below 15° F will freeze and dry out wet materials. If freezer space is not immediately available, and the outside temperature is below 15° F, place the materials in a secure area outside. Cover them with plastic if rain or snow is expected.

FREEZING IS AN INTERMEDIATE STAGE. After materials have been removed from the freezer, they must be placed in a vacuum freeze dryer or air-dried.

IV. Air-drying

Air-drying should be performed only in a stable environment to inhibit the growth of mold. The ideal environment for air-drying is 50-60° F and 25-35% RH. Instructions are outlined in II below (pages 16-18). This process is not recommended for coated stock materials (see III on pages 18-19 below).

The following salvage procedures are recommended:

I. Volumes to be frozen

  A. Removal

    1. Clear the floors and aisles first.

    2. Begin with the wettest materials. These will usually be on the lowest shelves, unless water has come in through the ceiling.

    3. Dirt and mold should be removed and treated before freezing (see II.A and VI below). If time does not permit these activities, dirty and/or moldy books may be frozen (mud will easily brush off when it is dry). Silt should be washed out immediately, as it is almost impossible to remove when it is dry.

    4. Pack materials on-site, if possible. If not possible, remove by human chain.

    5. Keep accurate records of the locations from which materials are removed.

  B. Packing

    1. Remove volumes from shelves in order.

    2. Wrap freezer paper around each volume (waxed side next to the volume) and place in plastic crates spine down.

    3. Pack crates one layer only, snugly enough that volumes will not slide or lean.

    4. Wrap open books as found and place on top of a packed container. Do not place more than one open volume in a container. Be sure there is a freezer paper barrier between the packed volumes and the open volume to prevent staining from binding dyes.

    5. If books are stuck together, do not attempt to separate them, but pack them as one volume.

    6. Pack items in the condition in which they are found. DO NOT ATTEMPT TO CLOSE OPEN VOLUMES OR OPEN CLOSED VOLUMES THAT ARE WET.

C. Record-keeping

1. Label each container with your institution's name and assign it a number.

2. On a separate sheet of paper, record the box number, call numbers of the first and last volumes packed, and the total number of books in each container. If they are not in call number order, note the location where found.

3. If the containers are sent to more than one freezer, note which container numbers are sent where.

4. Keep records of discarded items.

D. Transporting

1. Materials should be placed in a freezer facility as quickly as possible to prevent the growth of mold. Care should be taken that containers do not fall over during transport, as further damage may result.

2. Materials should be placed in refrigerated trucks if they cannot be frozen within forty-eight hours.

II. Volumes to be air-dried

A. Washing procedure (to be performed off-site only)

1. Keep the book tightly closed and hold it under cold, clean, running water.

2. Remove as much mud as possible from the binding by dabbing gently with a sponge. Do not rub or use brushes and do not sponge the pages or edges, as these actions can force the mud into the spine or the wet pages, causing further damage to the volume. Let the motion of the running water clean off the dirt.

(NOTE: A more extensive washing procedure, involving a series of rust-proof containers, may be used instead. See page 62 of Barton and Wellheiser's An Ounce of Prevention, cited on page 10 above, for instructions.)

3. Squeeze the book gently and with even pressure to remove excess water and to reshape the binding.

4. Do NOT wash
    a. open or swollen volumes
    b. vellum or parchment bindings or pages
    c. full or partial leather bindings
    d. fragile or brittle materials
    e. works of art on paper
    f. water-soluble components (inks, tempera, water-colors, dyes, charcoal, etc.)
    g. manuscripts
    h. non-paper materials

B. Saturated volumes

1. DO NOT OPEN -- wet paper tears easily!
2. Set volumes on their heads on absorbent paper. Pages tend to droop within the binding when a volume is shelved upright, so setting it on its head will counteract this tendency. Plastic sheeting should be placed under the paper toweling or unprinted newsprint to protect table tops. Turn the volumes right side up when changing the paper beneath them. Their position should be reversed each time the paper is changed and the wet paper removed from the area.
3. Covers may be opened to support the volume.
4. Aluminum foil may be placed between the cover and the endleaf to prevent staining from the binding dyes.
5. When most of the water has drained, proceed as for "Damp volumes."

C. Damp volumes

1. Very carefully open the book (not more than a 30° angle).
2. Begin interleaving from the back and keep the volume in an upright position.

3. Place interleaving sheets at intervals of twenty-five leaves (fifty pages), unless they will distort the volume.

4. Change interleaving frequently. Do not reuse unless the sheets are being impregnated with fungicide. Ortho-Phenyl Phenol (O-PP) has been found to be less toxic than thymol and is recommended. Mix one pound of O-PP to one gallon of acetone or ethanol (do not use methanol, as it will cause inks to bleed). Safety equipment (mask, eye goggles, and rubber gloves) should be worn when preparing and using this solution.

5. Continue to change the paper underneath and remove from the area.

D. Slightly damp volumes/Volumes with only wet edges

1. Stand volume on its head and fan open slightly. Paperback books may support each other with a barrier between them or they may be wedged with styrofoam pieces. Position volumes in the path of circulating air.

2. When almost dry, lay the volumes flat and place weights (not other drying books) on them to minimize distortion. DO NOT STACK WET VOLUMES.

3. Lightweight volumes (less than six pounds) may be hung on lines to dry.

   a. Use monofilament nylon lines, not more than 1/32" diameter, not more than five or six feet long, spaced approximately one-half inch apart.

   b. Do not line-dry a saturated volume as the monofilament will cut through the wet paper.

III. Volumes with coated stock paper

Wet coated stock paper should be handled with care, as the print will slide off the wet page if it is rubbed. Do not allow wet books with coated stock paper to dry in a closed state as the pages will permanently bond together. Almost all attempts to separate stuck pages by rewetting them have failed. McDonnell's Document Reclamation Service reports that vacuum freeze drying of coated stock volumes is rarely successful. Keep volumes submerged until the pages can be separated (see IV.B below). The only chance of saving such materials is to interleave every page and air-dry.

IV. Documents/Unbound materials

A. Freeze as found

1. Do not remove from file cabinet drawers, document cases, or folders.
2. Do not turn containers upside down to empty or drain.

B. Separation of wet sheets

1. Place a sheet of polyester film on top of a stack of wet, unbound papers (or the first page of a bound volume).
2. Rub gently with a bone folder -- surface friction will cause the wet paper to adhere to the film.
3. Peel back the top sheet and place it on top of a piece of polyester web.
4. Remove the polyester film.
5. Place another piece of polyester web on top of the wet sheet.
6. Repeat the entire process, separating the wet sheets one at a time and interleaving them with polyester web. (Materials may be frozen at this stage.)
7. Air-dry the sheets (supported by the polyester web) by placing them on absorbent paper on tables or on top of closely spaced monofilament lines. Air in the room should be kept circulating, but fans should not blow directly on the materials.
8. The papers may be flattened when they are almost dry by placing them between two sheets of blotting paper (to remove excess moisture) and applying even pressure with weights.

V. Non-book materials

A. Photographic materials (prints, negatives, slides, film)

Do not expect to salvage color photographs, as the colored layers will separate and the dyes will fade quickly. However, if you wish to try, freeze them immediately, or transport them (see 2 below) to a photographic laboratory.

Photographic materials should not be allowed to dry out after they become wet as they will stick to their envelopes or to each other. Any attempt to separate them after they have dried together will result in damage to the emulsion or the image. Remove the materials from their protective enclosures and wash off any mud or dirt under cold, clean running water.

The following options are available for salvaging photographic materials:

1. Air-dry either flat or on lines of monofilament (plastic spring-type clothespins may be used to hang them on the lines).

2. If there are too many to air-dry, they may be stored in cold water (65° F or below -- cold helps to preserve the emulsion). Ice may be added to the water, but do not add dry ice or allow the materials to remain under water longer than three days.

   Formaldehyde may be added to the water (fifteen milliliters to one liter) to help prevent the gelatin from swelling and softening. Black and white film could last three days in this solution before the emulsion begins to separate; color film could last forty-eight hours.

   Transport the materials (in sealed polyethylene bags inside plastic garbage pails) to a professional laboratory within twenty-four hours, if possible.

3. If time does not permit air-drying, the materials may be frozen. As the emulsion may be damaged by the formation of ice crystals, freezing as quickly as possible is recommended (smaller ice crystals will cause less damage). Negatives should be separated

   before freezing as they tend to stick together when thawed.

   4. The Eastman Kodak Company provides free emergency service for cleaning and drying its own black-and-white roll microfilm. Contact Don Franklin in the Chicago Lab (312-954-6000).

B. Microforms

   1. Silver halide microfilm

      a. Keep under water (see V.A.2 above).

      b. Send to Kodak or a professional microprocessing laboratory.

   2. Vessicular and diazo microfilm

      a. Wash off mud or dirt under cold, clean running water.

      b. Air-dry or dry with cheesecloth.

   3. Microfiche

      a. Treat the same as silver halide microfilm.

      b. Kodak will not treat microfiche, so send them to a professional microprocessing laboratory.

C. Tapes (audio, video, computer) and floppy disks

Water is especially damaging to magnetic materials. The longer they have been wet, the greater the damage will be. Do not attempt to play any damaged tapes or disks, as they can damage the equipment on which they are being played. The following procedures are recommended if you wish to attempt to salvage tapes:

   1. Break open the cassettes.

   2. Wash in clean or distilled water.

   3. Air-dry or dry with cheesecloth.

D. Sound recordings (disks)

Clean water probably will not damage sound recordings, but flood water carries silt, which will scratch a disk. Disks should be washed and dried with cheesecloth or a soft, lint-free cloth. Record jackets or paper protective sleeves should be discarded as they can trap moisture and may develop mold.

VI. Mold

Mold and mildew are interchangeable terms for fungi. They can never be killed and can remain dormant for many years. Spores are always present in the air and will grow when the environment is warm and humid. Freezing will inhibit the growth of mold and is recommended if time does not permit immediate treatment.

A. Mold can develop within forty-eight to seventy-two hours in an environment where the temperature is over 75° F and the relative humidity is over 60%.

B. Separate the affected materials to prevent spreading.

C. If the materials are wet and mold is beginning to develop, interleave the volumes with papers impregnated with a fungicide (see II.C.4 on page 18 above).

D. Keep the air circulating in the room.

E. Mold is easier to remove when it is dry. Vacuum or brush it off and remove the spores from the area.

F. Materials that will be fumigated should be removed from plastic crates, as plastic will absorb the fumigants. Fungicidal fogging should be done only by a professional chemist or conservator.

VII. DO NOT, UNDER ANY CIRCUMSTANCES,

...enter an area until it has been declared safe.

...attempt to open a wet book (one tear costs at least one dollar to mend!).

...attempt to close an open book that is swollen.

...use mechanical presses on wet materials.

...attempt to separate books that are stuck together.

...write on wet paper.

...use bleaches, detergents, water-soluble fungicides, adhesive tapes (or adhesives of any kind), paper clips, or staples on wet materials.

...use colored paper of any kind during salvage and recovery operations.

...pack newly-dried materials in boxes or leave them unattended for more than two days.

O-DRAT!

1-800-522-8116

The Oklahoma Disaster Recovery Assistance Team (O-DRAT) was created to provide on-site salvage assistance and/or advice in the event a disaster strikes any library or records repository in the State of Oklahoma. The following individuals may be called:

Gary Harrington
Preservation Officer
Oklahoma Department of Libraries
200 North East 18th
Oklahoma City, OK 73105
(405) 521-2502
1-800-522-8116

Howard P. Lowell
Administrator, Oklahoma Resources Branch
Archives and Records Division
Oklahoma Department of Libraries
200 North East 18th
Oklahoma City, OK 73105
(405) 521-2502
1-800-522-8116

Toby Murray
Preservation Officer
McFarlin Library
University of Tulsa
600 South College Avenue
Tulsa, OK 74104
(918) 592-6000, extension 2864

Be sure to provide the following information when requesting on-site disaster recovery assistance:

1. Your name, title, institution, and telephone number.
2. A description of the disaster and the time it is believed to have struck.
3. The extent and type of damage involved, including the types of materials affected.
4. Whether or not the in-house recovery team has been activated and the type of salvage operation planned or underway.
5. The salvage and recovery supplies on hand and those that will be needed.

6. Whether or not funding is available for the purchase of additional supplies and the name and telephone number of the individual authorized to approve such purchases.
7. Whether or not the utilities are functioning.
8. Directions for reaching the site and a description of the individual to contact upon arrival.

BIBLIOGRAPHY

Bibliography on Disasters, Disaster Preparedness and Disaster Recovery will be distributed with these guidelines. As this bibliography is updated periodically, a copy of the most recent update may be obtained free upon request from Gary Harrington, Preservation Officer, Oklahoma Department of Libraries, 200 North East 18th, Oklahoma City, OK 73105 (405-521-2502 or 1-800-522-8116) or from the compiler, Toby Murray, Preservation Officer, McFarlin Library, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104 (918-592-6000, extension 2864),

PROCEDURES FOR SALVAGE OF WATER-DAMAGED LIBRARY MATERIALS

Second Edition

PETER WATERS, *Restoration Officer*
Preservation Office
Research Services

LC Publications on Conservation of Library Materials

LIBRARY OF CONGRESS WASHINGTON 1979

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PREFACE

This document has been prepared to assist those faced with the need to salvage library and archival materials affected by floods or water from firefighting, broken water pipes, or other accidents resulting in severe water damage. The procedures suggested here are designed to save a maximum amount of material with a minimum amount of restoration and replacement. No general instructions, however, can take the place of an assessment of a given situation on site by a qualified, experienced library or archival conservator, and it is strongly recommended that such assistance and advice be sought at the earliest possible moment after a disaster. Individuals and institutions known to have had actual experience in dealing with these problems are listed in the appendix. In addition, the Restoration Office of the Library of Congress stands ready to serve as an information center and, if need be, as a coordinating agency for emergency salvage efforts.

The author has set forth in the text the various considerations involved in the reclamation of water-damaged library and archival collections, but the following points cannot be over emphasized. The complete restoration of water-soaked documents, particularly items in bound form, can be a costly process even under favorable conditions. In the majority of cases, the high costs involved do not justify the salvage and restoration of books which are in print and/or replaceable. Vacuum or freeze drying is the most effective method yet discovered for removing the water from large numbers of books and other paper artifacts, but ordinarily it is not the final step in the reclamation process. In some cases, volumes which are only damp or which have suffered very minor physical damage before freezing will come from the drying chamber in such good condition that they can be labeled and sent directly to the shelves. In the vast majority of instances, however, drying must be followed by restoration and rebinding, which can be expensive.

Thus, librarians and others faced with the decisions which follow serious flooding or fires need to remember that replacement is nearly always much less costly than restoration. Nevertheless, the necessity of making sound, on-the-spot, cost-effective judgments is the best reason for seeking the advice of an experienced conservator or other person who can help in assessing the situation.

The author wishes to express his appreciation to colleagues of the Library's Preservation Research & Testing Office for their assistance with several related testing projects. Of particular value was the work of Robert E. McComb of that office, who shared with the author the direction of salvage operations following the fire at the Klein Law Library, Temple University and also assisted with salvage operations at the Military Personnel Records Center in St. Louis, damaged by fire in July 1973. Such close cooperation between conservator and scientist, as joint technical directors in salvage efforts, is a source of great satisfaction to the Library of Congress and its Preservation Office. It is hoped that collaboration with administrators of collections will become the rule rather than the exception.

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#30

ASSESSMENT OF DAMAGE AND PLANNING FOR SALVAGE

Weather is the critical factor in determining what course to take after any flood or fire in which museum, archival, or library materials are damaged. When it is hot and humid, salvage must be initiated with a minimum of delay to prevent or control the growth of mold. When the weather is cold, more time can be taken to plan salvage operations and experiment with various drying procedures.

The first step is to establish the character and degree of damage. Once an accurate assessment of the damage has been made, firm priorities and plans for salvaging the damaged materials can be drawn up. These plans must include a determination of the special facilities and equipment required. Overcautious, unrealistic, or inadequate appraisals of damage can result in the loss of valuable materials. Speed is of the utmost importance, but careful planning is equally essential in the salvage effort.

Where water damage has resulted from fire-fighting measures, cooperation with the fire marshal is vital for a realistic appraisal of the feasibility of salvage efforts. Fire marshals and safety personnel will decide when a damaged building is safe to enter. In some cases, areas involved in the fire may require a week or longer before they are cool enough to be entered. Occasionally, parts of a collection may be identified early in the salvage planning effort as being especially vulnerable to destruction unless they receive attention within a few hours after the fire has abated. If the fire marshal appreciates such needs, he may be able to provide means of access to the area even when other parts of the building remain hazardous.

Once all entrances and aisles are cleared, the most important collections, including rare materials and those of permanent research value, should be salvaged first, unless other materials would be more severely damaged by prolonged immersion in water. Examples of the latter are books printed on paper of types widely produced between 1880 and 1946, now brittle or semibrittle. However, materials in this category which can be replaced should be left until last.

Salvage operations must be planned so that the environment of flooded areas can be stabilized and controlled both before and during the removal of the damaged materials. In warm, humid weather, mold growth may be expected to appear in a water-damaged area within 48 hours. In any weather, mold will appear within 48 hours in unventilated areas made warm and humid by recent fire in adjacent parts of the building. For this reason, every effort should be made to reduce high temperatures and vent

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the areas as soon as the water has receded or been pumped out. Water-soaked materials must be kept as cool as possible by good air circulation until they can be stabilized. To leave such materials more than 48 hours in temperatures above 70°F and humidity above 70 percent will almost certainly result in heavy mold growth and lead to high restoration costs.

Damaged most by these conditions are volumes printed on coated stock and such highly proteinaceous materials as leather and vellum bindings. Starch-impregnated cloths, glues, adhesives, and starch pastes are affected to a lesser degree. As long as books are tightly shelved, mold will develop only on the outer edges of the bindings. Thus *no* attempt should be made in these conditions to separate books and fan them open. Archival files packed closely together on the shelves in cardboard boxes or in metal file cabinets are the least affected.

As a general rule, damp books located in warm and humid areas without ventilation will be subject to rapid mold growth. Archival files which have not been disturbed will not be attacked so quickly by mold. Very wet materials, or those still under water, will not develop mold. As they begin to dry after removal from the water, however, both the bindings and the edges of books will be quickly attacked by mold, especially when in warm, unventilated areas. A different problem exists for books printed on coated stock, since if they are allowed to dry in this condition, the leaves will be permanently fused together.

Cellulose absorbs water at different rates depending on the age, condition, and composition of the material. Thus, some understanding of the mechanism of swelling action, as well as the development of mold, is essential to planning a successful salvage operation. In addition, when large collections are at stake, one must be able to calculate in advance the approximate amount of water which will have to be extracted in the drying process. Of equal importance is some knowledge of the length of time each type of material can be submerged in water before serious deterioration occurs.

Estimating Water Absorption. Generally speaking, manuscripts and books dated earlier than 1840 will absorb water to an average of 80 percent of their original weight. Since there is a greater concentration of proteinaceous material and receptivity to water in such early books, they are especially vulnerable to mold but will withstand longer periods of time submerged in water than will books printed on the less durable papers of more recent years. Modern books, other than those with the most brittle paper, will absorb an average of 60 percent of their original weight. Thus, in estimating the *original* weight of a collection, if one assumes an average of four pounds per book when dry for 20,000 books in each category, drying techniques must be set up to remove 64,000 pounds of water from the earlier materials and 48,000 pounds from the later.

The major part of all damage to bound volumes caused by swelling will take place within the first eight hours after they have been soaked. Since the paper in the text block and the cardboard cores of book covers have a greater capacity for swelling than the covering materials used for the bindings, the text block of a soaked book usually expands so much that the spine assumes a concave shape and the fore-edge a convex, thus forcing the case to become partially or completely detached.

Leather and vellum covers, especially those of the 15th, 16th, and 17th centuries, can usually be restored successfully if they are allowed to dry slowly. However, this should only be done under controlled environmental conditions by a trained conservator or under the supervision of a conservator. Unfortunately, modern manufacturing processes so degrade the natural structure of leather that, once water soaked, covers of these later materials are often impossible to restore. Some leather bindings will be reduced to a brown sludge, and others will shrink by as much as one-tenth of their original size.

Swelling of covering materials, such as cloth, buckram, and certain plastics is negligible. Cover cores, however, which are made of a highly absorbent cardboard, swell faster than an equivalent thickness of text block. Book covering materials which have already deteriorated will absorb water at about the same rate as the cores.

Once access to the collections is gained, the external appearance of each volume and group of volumes is a useful indication of the degree of water damage. Those volumes found, usually in heaps, in the aisles will be the most damaged. Not only will they have sustained the shock of falling, as rapid swelling caused them to burst from the shelves, but they will also have been immersed in water for a longer period than the volumes on the shelves above them. These will need the most extensive restoration. The appearance of such volumes can be a devastating shock, but one must not give way to panic; every volume can be saved, provided it is worth the cost of salvage and restoration, and provided the method of removal described here is followed.

Shelves which have been submerged will usually contain a mixture of wet and partially wet volumes. Misshapen volumes with concave spines and convex fore-edges can be immediately identified as belonging in the category of very wet. These will need to be rebound after they have been thoroughly dried. Others may still maintain their normal shape because they have absorbed less water. These stand the best chance of drying without distortion. Hand-bound volumes in this condition may only need recovering.

Coated papers *must not* be permitted to begin drying until each volume can be dealt with under carefully controlled conditions. The period between pumping out the water and the beginning of salvage efforts is critical. It may be desirable to leave these volumes under water until a few hours before they are to be removed.

Stabilization by Freezing. The most generally accepted and proven method of stabilizing water-damaged library and archival materials is by freezing and storing at low temperature (-20°F). This buys time in which to plan and organize a controlled, carefully coordinated drying operation. Freezing gives the restorer time to dry individual items and collections in the knowledge that they will be in the same condition upon thawing as before they were frozen. Cold storage provides accessible and inexpensive space (about 50 cents per 100 pounds per month in 1974) in which large quantities of books can be stabilized in the condition in which they were found, preventing further deterioration by water and mold while awaiting treatment.

Freezing is not a drying method, nor will it kill mold spores, but it is highly effective in controlling mold growth by inducing the dormant state in the spores. The drying method chosen at a later date must be such that mold is kept dormant so that subsequent sterilization can achieve maximum benefit.

Stabilization by freezing also provides important advantages when it is not possible to assess immediately the value of the damaged materials or to determine which items can or cannot be replaced. In other words, such stabilization gives time in which to estimate recovery costs, to prepare adequate environmental storage conditions, and to restore the buildings affected. In some cases, it may be necessary to restore or rebuild the original facilities–a process which can require a long time.

Had the freezing technique been used after the catastrophic Florence flood in 1966, thousands of additional volumes could have been saved completely or would have suffered significantly less damage. The Florentine libraries which sustained the greatest losses contained mostly 19th- and 20th-century materials. In these collections, losses were heaviest among books printed on coated stock, whose leaves stuck together during drying and could not be separated afterward. These losses could have been largely prevented if the materials had been frozen while wet, and if drying methods now known had been used to prevent adhesion of the leaves.

Saturated volumes which have lost their shapes or have had their binding structures damaged by immersion will increase in thickness still more in freezing, but this additional increase in thickness has been found to contribute no further damage to already damaged volumes. In fact, studies conducted by the Research & Testing Office of the Library of Congress have uncovered no evidence of any damage to cellulosic and proteinaceous materials caused by freezing.

Freezing as a salvage method has several advantages. It stabilizes such water-soluble materials as inks, dyes, etc. which may diffuse during conventional drying. Carefully controlled freeze-drying and vacuum-drying techniques cause the water to sublime, i.e., pass from the frozen to the vapor phase without going through the liquid phase. Under these conditions feathering of inks is negligible. Further, freeze drying reduces stains and reduces or eliminates the odor caused by smoke. Materials can be left frozen for an indefinite time if necessary. Some large collections have been kept in a frozen state for as long as six years before drying, with little or no permanent damage. Experience gained during the past 15 years has demonstrated that the most satisfactory method of stabilizing water-damaged books, manuscripts, maps, unframed prints and drawings, and archival collections is freezing.

Preparation for Freezing. Before freezing, it is preferable to wash away accumulated mud and filth, but this is rarely possible because of lack of time and the quantity of material to be handled. Washing should never be attempted by untrained persons as this may cause further damage, nor should time be taken for this purpose if so little help is available that any significant delay in freezing the bulk of the materials would result.

The washing of materials containing water-soluble components, such as inks, watercolors, tempera, dyes used in certain maps, and the like, should not be attempted in any circumstances. Experience has shown that such materials, as well as those that are fragile or delicate, can be seriously or irreparably damaged by untrained workers attempting to clean and restore on-site. Such materials need expert attention and hours of careful work if damage is to be kept to a minimum. The period of emergency action and "first-aid" is no time for the careful work required to restore materials to near-original state.

The general condition of the damaged materials will determine how much time can be spent in preparation for freezing. At the least, bound volumes should be wrapped in freezer paper, wax paper, or silicone paper to prevent their sticking together during the freezing process. Groups of sheet materials such as manuscripts, records, unframed prints and drawings, and the like should also be wrapped, the packages not to exceed about two inches in thickness. Each package should be marked to indicate type of material, its previous location, and its priority. However, if it is known that the damaged materials will be vacuum or freeze dried after freezing, the wrapping step may be avoided by substituting milk cartons (see below) as a means of limiting the materials to be frozen to small groups which are more readily handled.

When only a few items are involved, freezing can be accomplished in a home freezer. Naturally, if the collection numbers hundreds or thousands of volumes, larger facilities will be required. The temperature for freezing should be at least -20°F. Lower temperatures will do no damage. Rapid freezing produces the smallest possible ice crystals and is desirable for this reason, especially if the material is to be freeze dried at a later stage.

If freezing space is limited, priority should be given to the following types of materials: items which have already developed mold, leather- and vellum-bound volumes, manuscripts, art on paper, materials on coated stock, artifacts with water-soluble components (inks, watercolor, tempera, various dyes, etc.), and photographic prints.

Containers and Methods of Packing for Freezing. Interlocking plastic milk crates make excellent containers for packing wet materials. These measure one cubic foot, are easily lifted, and offer the most efficient unit for freeze or vacuum drying, if one or the other process is to be used at a later date. They will not crush and can be stacked on pallets to a level just below the roof of a refrigerated truck. They also provide compact and safe storage in a freezer plant.

If interlocking milk crates are not obtainable, strong cardboard boxes (approximately two cubic feet), similar in size to beer cases or boxes used by libraries for sending books to library binders, may be used. However, because wet books will make the boxes damp and abnormally heavy, cardboard boxes cannot be stacked as high as milk crates without both boxes and their contents being crushed.

Materials should not be packed tightly in either type of container. Faster freezing and subsequent drying will be accomplished if the cartons are packed approximately three-quarters full.

It should be possible to move the wet materials directly from library to freezing facility, preferably in refrigerated trucks which can be drawn up to the loading site. For small collections of books and documents, dry ice may be used to freeze the material for transport in unrefrigerated trucks to long-term freezing facilities. Gloves should be worn when handling dry ice to avoid "burning" the hands.

Drying Large Collections by Vacuum and/or Freeze Drying. If materials have been sent to freezing facilities, the next consideration is the choice of drying methods. By far the least expensive and most successful method for drying large collections is vacuum and/or freeze drying. Since the first edition of this manual, two very large collections have been successfully vacuum dried, one by the General Electric Company, Valley Forge Space Center, Valley Forge, Pa., and the other by the McDonnell Douglas Corporation, Saint Louis, Mo. These operations were successful in drying wet and frozen materials at far less cost than hand drying. In both cases, the

Preservation Office of the Library of Congress established the general guidelines to be observed, beginning with initial salvage procedures and following with technical advice during subsequent stages in the drying operation. The vacuum chambers used hold between 2,000 and 3,000 books at one loading, or the equivalent in records.

Although there are potential dangers in both the freeze drying and vacuum drying processes, they are entirely safe under carefully controlled conditions. However, early manuscripts and rare printed books should not be mixed in with deteriorated or brittle materials, because of the possibility of acid migration from the latter to the former during the drying process.

Rehabilitation After Freezing and Drying. If maximum benefits are to be gained from stabilization by freezing, every effort should be made, first, to identify and assess the value, condition, and total numbers and types of materials damaged, and second, to draw up comprehensive lists of those materials which can be replaced and those which should be reclaimed and restored. *Replacement is nearly always cheaper than restoration.*

Volumes to be reclaimed will need to be evaluated in terms of the amount of restoration needed and probable costs. The best time to make such judgments is after the volumes have been dried and before they are returned to the library.

If the water-damaged material was infested by mold at the time of freezing, it should be sterilized. In vacuum drying, sterilization with ethylene oxide (mixed with either CO_2 or Freon) is easily accomplished at the end of the drying process, while the materials are still in the vacuum chamber. The results are well worth the small additional charge.

In addition, although the sterilized materials are safe until environmental conditions may again be favorable for mold growth, it is suggested that sterilization be followed by fogging the chamber with a solution of 12 percent thymol in trichloroethylene. This treatment acts as a temporary "fungicidal buffer" and confers a high degree of resistance to further attack, even when conditions are favorable for mold growth. This treatment also provides an additional safeguard in case sterilization was not thoroughly done.

It should be remembered that sterilized material can be reinfected by mold, especially if placed in an environment characterized by poor ventilation and high humidity. For this reason it is imperative to avoid mixing sterilized and unsterilized material. Under no circumstances should newly dried materials be packed in boxes and left without attention for more than a few days.

Ideally, all water-damaged materials should be sterilized. Where this is not possible, the following precautions should be observed:

1. All returned, dried materials should be placed on open shelving in a ventilated and air-conditioned "rehabilitation" area, well separated from the main collections. Such a rehabilitation area makes it easier to assess the condition of the dried materials, as well as to identify those that can be replaced and those that must be restored, and to plan for restoration. A carefully organized, random inspection for mold-infected materials can be conducted daily by personnel trained to carry out this important task in the rehabilitation process. Whether materials have or have not been sterilized during the drying process, it is necessary to monitor their behavior as a check against the effectiveness of sterilization and to identify any potential for mold growth before the return of these materials to the main collection.

We are concerned here with monitoring the dried volumes while they are in the rehabilitation area. It is good practice, however, to make a random selection of several volumes from such groups and to check them for possible development of mold following their return to the main stacks. This monitoring should be continued at regular intervals for at least a year after reshelving.

The rehabilitation area should be able to maintain a relative humidity of 35 to 45 percent and a temperature not exceeding 65°F. Both humidity and temperature controls must be adjustable. It is desirable to maintain the collection in the rehabilitation area under these conditions for a period of at least six months, if at all possible. At this time, temperature and humidity in the rehabilitation area can be gradually changed to duplicate conditions in the stack area to which they are to be returned. At the end of this time, if no mold growth has occurred, the volumes can be returned to the main stacks and monitored as indicated above. It is highly desirable but usually not practical to leave volumes in the rehabilitation area for an added six months as a check against later mold growth.

2. No materials should be returned to the main library shelves without very careful inspection by a qualified conservator, and preferably not before all necessary restoration is complete.

FIRST PROCEDURES FOR SALVAGE

These procedures apply whether or not freezing is to follow.

1. In winter, turn off all heat in the building. In summer, reduce the temperature as much as possible through air-conditioning, if available.

2. Create maximum air flow through all affected areas by opening doors and windows. If electrical facilities are operational, use as many fans as can be acquired to create a current of air so directed as to expel the humid air from the building. If dehumidifiers are available they may be used with fans for small enclosed areas. The object is to avoid pockets of stagnant, moist air.

3. If house electricity is not available, hire portable generators to provide electricity for lights, fans, dehumidifiers, and other electrical services. For safety purposes, all electrical lines should be waterproofed and grounded.

4. Do not permit anyone to open wet books; to separate single sheets; to remove covers when materials are water-soaked; or to disturb wet file boxes, prints, drawings, and photographs. Such handling can result in extensive and often irreparable damage to materials that otherwise might be salvaged. *Reducing the cost of future restoration must be one of the top priorities of the salvage operation.*

5. Organize a disaster team and prepare a comprehensive plan of action, as well as plans for different contingencies.

6. Do not attempt to remove materials from the area until an overall plan with a schedule of priorities has been established and all personnel thoroughly briefed.

7. Canvass the community to locate freezing and storage space.

8. Seek the advice of specialists who can assist at the site of the disaster.

THE SALVAGE TEAM

Conducting a successful and efficient salvage operation after a major flood or similar disaster requires, in addition to a good supply of dedicated labor, a team of experts who should be assembled before practical work begins.

The leader should be a person who has had practical experience and understands the effects of different environmental conditions on water-soaked materials of all types, conditions, and ages. His team should consist of a librarian or archivist who knows the collection intimately, one or more archival conservators to assist, a building maintenance engineer, an electrician, a carpenter, a plumber, and a chemist if available. One or more persons familiar with national and local resources are highly desirable to assist in locating and procuring the special facilities, equipment, and supplies needed during the operation. They should be familiar with using the Yellow Pages to track down materials and equipment, able to seek out the key chemical supply companies in the country, if necessary, and generally able to cut through red tape.

The assembled team should be carefully briefed on the general procedures to be followed, various contingency plans which might have to be adopted, priorities to be observed, and their own specific responsibilities. The basic objectives are: 1) to stabilize the condition of the materials before removal by creating the environment necessary to prevent further damage, and 2) to salvage the maximum number of volumes from the damaged collections in a manner which will minimize future restoration and its costs.

PRELIMINARIES TO REMOVAL FROM AFFECTED AREAS

The Catalog and Other Records of the Collection. High priority should be given to salvaging the catalog and other records of the collection. Salvage operations should avoid any action that might remove or deface identifying marks and labels. When part or all of the catalog or other bibliographic records have been lost, it may be necessary to make a chart of the flooded area and label each item as it is withdrawn to show its location. Such a procedure will assist later efforts to identify materials which have lost their call numbers. One or more persons must be assigned specific responsibility for making such records because the time and expense involved in subsequent identification and recataloging of damaged materials can be substantial.

Conveyor belts and "human chains" should be used to remove materials from each shelf and pack them in boxes or plastic milk crates numbered sequentially before being sent down the line. This system was used successfully in the removal of approximately 160,000 rare book items from the basement of the Klein Law Library, Temple University, after the fire of July 1972.

Manuscripts and other materials in single sheets create particularly difficult problems if they have been scattered. An indication of the approximate location in which they were found during the salvage operation may be extremely helpful at a later date. Materials should never be moved from the site in large batches or left piled on top of each other, either at the site or in adjacent temporary housing, since the excessive weight is very damaging.

Fungicidal Fogging. Before removal begins, and during the entire packing operation, a constant watch should be kept for signs of mold development. With large collections, if access has not been permitted for several days, it may be necessary to use fungicidal fogging. However, this should never be attempted unless the operation is supervised by a competent chemist or conservator who will be responsible for the safety of personnel, the area, and the materials. Where fogging is necessary, a mixture of one pound of thymol to one gallon of 1,1,1, trichlorethane, for approximately 20,000 cubic feet, can be used. Areas to be fogged should be emptied of personnel, fans and dehumidifiers turned off, and then sealed as completely as possible. The best time to fog is between 9 and 10 p.m., since at least six hours should elapse before the area is vented and fans and dehumidifiers turned on again. At least three more hours are necessary before salvage crews return to the building. It cannot be overemphasized that this procedure, when necessary, should never be attempted without supervision. ***Appropriate safety precautions must be established and observed.***

Preliminary Steps. If the materials are to be frozen, prior arrangements should be made to ship the packed materials immediately to the freezing facilities. Packed materials must not be allowed to remain on or near the site for more than a few hours, since such delay will further increase the possibility of mold development. Finally, before actual removal of the water-soaked material begins, lighting, fans, dehumidifiers, and all possible venting should be fully operational.

All work surfaces should be covered with polyethylene sheeting. Areas selected for packing or drying should be prepared for the operation by emptying them of all unnecessary equipment and furniture. As much work surface as possible at a convenient height should be provided.

The Work Force. Safety of the materials and future restoration costs will depend largely on the competence and dedication of the salvage crews. The work will be arduous, dirty, and often frustrating. Team leaders should not hesitate to dismiss careless and thoughtless workers. Experience has shown that well-disciplined crews having brief rest periods with refreshments about every hour and a half are the most efficient. Working salvage crews to exhaustion pays no dividends.

Removal and Packing. The aisles between stacks and main passageways will probably be strewn with sodden materials. These should be removed first, separately, by human chain, in the exact condition in which they are found. Open books will be greatly swollen, but no attempt should be made to close them. Closing them will only cause further damage by tearing the leaves, since paper will not slide when wet. Instead, books should be passed undisturbed to an adjacent dry area where a team should be waiting to pack them, again without disturbing their shape. The packing team should have the same number of people as the team which passes the damaged material to them. This will avoid bottlenecks and stacking materials on the floor to await packing.

If a sufficient number of people and conveyor belts are available, the most efficient place to pack damaged materials will be on the site. Teams will have to be organized to assemble packing materials and supply them to the packers in a smooth flow. Use of a second human chain or conveyor will reduce bottlenecks and the likelihood of incoming supplies interfering with the flow of packed materials being passed out of the building.

Starting from the nearest point of access, pack the wettest materials first. This is an essential step in bringing down the humidity level in the whole area. Since books on the lower shelves are those most likely to be wet, these should be removed first, in horizontal sequence. As each line of shelves is emptied, an assistant should code each box and record the box number and its general contents in a notebook.

The contents of archival storage boxes are unlikely to be saturated with water if they were previously positioned close together. However, since certain types of boxes have a corrugated inside layer, they may be very wet, even though the major portion of the contents is only damp. In such cases, it is best to repack the contents in new boxes or in plastic milk crates. This will not only make each unit lighter to lift and prevent the collapse of a wet box but will also speed the drying. When repacking it is important that the new boxes be properly identified as to contents.

Disposition of Remaining Drier Materials and Cleaning Affected Areas. After first removing the wettest materials, the very damp or partially wet materials should be removed. Only then should the balance of the collection be inspected. These volumes will usually be above the first four or five shelves and packed closely together. On no account should this third category be separated or spaced out during the earlier salvage of the wettest materials. Closely packed materials will *not* develop mold internally. However, since these will have been in a very humid atmosphere for several days, it is likely that the external parts will have been exposed to a far greater quantity of mold spores than is usual under ordinary circumstances.

During clean up of the area, it is not wise to leave these drier collections in place. They should be moved to a controlled environment while shelves, walls, floors, and ceilings are sterilized and necessary maintenance work is being done to return the site to its normal condition. If moved, materials should be stacked with air spaces between them. A good circulation of air should be provided, together with air-conditioning and dehumidification. If air-conditioning is not available, fans and dehumidifiers should be used to keep air moving and to extract some of the moisture from the air.

The relative humidity of a drying area is no guide to the actual moisture content of cellulose materials. The normal water content of paper is between 5 and 7 percent by weight. Materials which feel relatively dry to the touch as they come out of a humid, flood-damaged area, may actually contain from 10 to 30 percent water.

Heat is one of the best means of drying, but since it increases the risk of mold development on humid books and documents, it should be used only if a good circulation of air and dehumidification can be established. Hygrothermographs for recording temperature and relative humidity should be installed to monitor the general area, and moisture-content meters are useful for measuring the moisture in the materials themselves.

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Preparations for Drying. The following procedures should be attempted only by trained leaders and well-supervised staff. All drying rooms should be set up well away from the affected areas. They should have a controlled environment which will remove moisture-laden air and which can be maintained at a constant temperature. Additional heat may be supplied to these areas provided the air is well circulated at all times. Pockets of stagnant air should not be permitted, and cleanliness should be maintained by prompt removal of wet debris as soon as collected. Plastic bags designed for garbage or lawn clippings are ideal for this purpose. One or more persons should be assigned the task of keeping work areas and floors as clean as possible and free of wet material to reduce moisture and to avoid loss or damage to manuscript leaves and parts of documents mixed in the debris.

Wet materials should be separated into *small units*, either by loose packaging or individual wrappings, to permit a free flow of air around them and to prevent the crushing which occurs when materials collect in large piles.

Cleaning. If adequate assistance is available, mud deposits on books which will not be further damaged by water may be washed off in clean, running water. Closed books should be held, one at a time, under water and the mud removed with a sponge used with a gentle, dabbing action. Similar washing should *not* be attempted with opened volumes, manuscripts, art on paper, or photographs.

Rubbing and brushing should be avoided, and no effort should be made to remove oil stains at this stage. Anything which is hard to remove is better left until after drying, when techniques for removal can be worked out during the restoration stage. If necessary, printed books bound in cloth or paper can be left immersed in clean running water for as long as two weeks. Although this should be avoided if possible, it is preferable when the only alternative is leaving the books in warm, humid air while awaiting treatment.

Thorough Washing. A more thorough washing procedure, intended to remove as much mud and slime as possible from books, requires six to eight tanks big enough to accommodate the largest volumes in the collection.

This process is obviously wet and messy and ideally should be set up outdoors in fair weather or in a garage, large shed, or basement in bad weather. Since large quantities of water are required, the area will be wet and dirty throughout the operation, and good drainage is therefore essential.

Any rustproof receptacles may be used if they are large enough, but plastic garbage cans (20 or 30 gallons) are recommended. Each can should be equipped with a hose to provide low-pressure, continuous water flow to the bottom so that dirty water, as it overflows the rim, will be constantly replaced by fresh. Each hose should be fastened securely to prevent any damage to the books being washed. Wooden duckboards, rubber boots, and aprons are recommended for the protection of workers.

Keeping a book tightly closed, the worker should immerse it in the first can and remove as much mud as possible by gentle sponging *under* water. Workers should *not* use brushes and should not rub. Books should be passed from one can to the next and the same operations repeated until most of the mud has been removed. At the last can, books should be rinsed by spraying them gently with a fine stream of water. As instructed under "Cleaning," no effort should be made to remove mud which continues to cling after sponging under water. This is much better done when the books are dry. The remaining water should be squeezed from books with the hands only; *mechanical presses should not be used.*

It must be emphasized that the above procedure should be attempted only by a carefully instructed team. If there is any doubt about the ability of the team to follow directions, washing should not be attempted. There are many classes of books which should not be washed under any circumstances, and it is therefore imperative to have the advice of an experienced book conservator who can recognize such materials and who understands their treatment.

Mud. When materials have been exposed to mud-saturated river water, experience has shown that the best time to remove fine silt is before the materials have dried, but *not* on-site. All flood-damaged materials should be frozen so that each item can be properly treated later. If mud-saturated paper is allowed to dry before restoration, fine silt deposits are almost impossible to remove completely.

Conventional Drying of Wet Books with Covers Intact. One of the safest ways to determine the rate of water removal during drying is by weighing. Thus for small collections of very valuable items, it is helpful to weigh each book at the start of the drying period. For large collections this is generally impractical.

After the closed book has been washed it should be stood upright on the head end. The head is preferred since the book, in normal use, will have had a tendency to sag at the head end, a tendency that would be further aggravated by the weight of wet leaves. Turning the volume on the head will even the strain on the text block, i.e., the leaves of the book, without the covers.

Do not fan the leaves to make the volume stand up; merely open the covers slightly and let stand while draining. To provide further support for the book while it is draining, use Styrofoam, sponge rubber, or similar material three-sixteenths of an inch thick, cut into small pieces three-quarters of an inch wide and slightly longer than the thickness of the book block. Place a piece under the front edge of each book to keep it balanced in the upright position and tilted slightly backward. A toothpick placed under each cover about midway from front to back will keep the boards or covers in position while water is draining.

Washed books should be stood on several sheets of absorbent paper cut to the approximate size of each book. Newsprint stock, unprinted, is cheap and will work well for this purpose. It is important that these sheets be replaced frequently as they absorb water, and the wet sheets should be removed from the working area. Prepare thymol-impregnated sheets according to directions in the following section and place these between the front and back covers and the adjacent flyleaves. The covers of books are usually the last parts to dry out, and therefore the area between the board papers and flyleaves will be the first to be attacked by mold. Use of the thymol-treated sheets will reduce the possibility of mold damage to these areas. It is also useful to place a sheet of aluminum foil, polyester, or polyethylene film between the thymol-impregnated paper and the leaves of the book. The inner portion of the book will dry first, and the foil or plastic sheet will prevent the water held in the covers from migrating to the inside of the book.

Preparing Thymol-Impregnated Sheets for Interleaving. Thymol-impregnated sheets to be used as mold inhibitors will be needed in large quantities for the next steps in the drying process. To prepare these, cut unprinted newsprint stock into sheets of graduated size according to the sizes of the books to be treated. A few standard sizes such as 4 by 6 inches, 5 by 7 inches, 8 by 10 inches, and 10 by 12 inches should be adequate. Dip each sheet in a 10 to 15 percent solution of thymol crystals in ethanol, acetone, industrial denatured alcohol, or trichlorethane (1 pound per gallon of solvent). Because the vapors of these solutions are toxic and flammable, this operation must be performed outdoors. Rubber gloves, goggles, and a respirator of the type used by painters should be worn for the protection of the operator. Treated sheets should be air dried on polyethylene-covered tables. The treated sheets will dry quickly. They should then be gathered in bundles of convenient size and wrapped in aluminum foil or polyethylene and stored in a cool place until needed. Wrapping is necessary because of the volatility of thymol.

Thymol is not an effective fungicide for all types of mold, but it has been used successfully in major flood disasters. It is especially recommended because it is one of the least toxic of fungicides, can be handled with relative safety by workers, and is harmless to cellulosics.

Interleaving with Thymol-Impregnated Paper. A current of air and frequent changes of the absorbent paper lying under each book will quickly dry the books to the point at which, with care, they can be opened with little risk of damage. Proceed with great caution when first attempting to open a book which has been drying. Keep the opening shallow and do not open the covers to more than a 30-degree angle at the first attempt. As soon as the book can be opened safely, begin interleaving with sheets of treated newsprint stock or strong paper toweling at intervals of 25 leaves (50 pages), starting from the back of the book. It is highly desirable to keep books in the upright position during this first interleaving/drying stage.

Interleaving should be changed frequently, and care must be exercised not to interleave too much; otherwise, the spine will become concave and the volume distorted. If drying conditions are unfavorable because of high humidity, it may be necessary to interleave every five leaves, and to change sheets every two or three hours to dry the book with reasonable speed. Under these conditions, a distorted book is preferable to a moldy book. As the book becomes drier it can be opened flat on the spine and boards and interleaved more closely. Interleaving, however, should not exceed one-third the total thickness of the volume.

Some further details on the interleaving technique may be useful:

1. Used and damp interleaving sheets should not be reused unless first impregnated with thymol and dried.
2. Frequent changing of interleaving material is much more effective than allowing large numbers of sheets to remain in place for extended periods.
3. Newsprint should not be left in books after drying is complete.
4. A good grade of paper toweling is more effective than newsprint, but the cost is significantly greater, especially for a large collection.

Drying Distorted Books on Lines. Books tend to become distorted by the action of water swelling the leaves and by the interleaving. In such cases, the spine forms a concave shape when the book is closed. Hanging a partially dry volume on three or more short lines will help the spine return to its original shape as it dries. Such lines should be of monofilament nylon, not more than one thirty-second of an inch in diameter, not more than five or six feet long, and approximately one-half inch apart. Three lines are enough for a volume of ordinary thickness—up to one and one-half inches. Thicker volumes will require more lines, but no volume should be hung up if it weighs more than six pounds. The reason for this is that the inner folds of book sections are often thin and certainly fragile when wet, and hanging a heavy book in this condition will cause the folds to fracture.

Dampness will persist for some time in the inner margins, along the spine, and between boards and flyleaves. This is particularly true of volumes bound on oversewing machines.

If the volume was weighed while wet, it is possible to determine the extent to which it has dried by weighing it again during the interleaving process and finally by measuring the water content of the paper by a special moisture meter. When the volume has lost about two-fifths of its original wet weight, it may be hung on the nylon lines. If the volume was not weighed while wet, its stage of drying can only be guessed. However, if there is no water dripping from the book, if the paper feels damp but not wet, and if the book can be opened easily throughout, it is dry enough to hang or to be stood upright in the airflow from fans.

Under no circumstances should books be hung when saturated with water. In addition to the danger of mechanical damage, some spine adhesives, especially those made of gelatin, will migrate through a suspended, wet book and cause staining as well as adhesion of leaves.

Drying Wet Books with Soft Covers. The technique of wedging a wet book with pieces of styrofoam to enable it to stand upright for draining is not applicable for books with paper covers or those with covers missing. Such books may be stood on either head or tail, and if they will not stand alone, they may be allowed to support each other, with cardboard spacers placed between them. Experience on the site will suggest the best method.

Drying Books With Only Wet Edges. In the case of volumes in which only the edges are wet, the drainage procedure is omitted. Interleave from the back of the book, turning pages carefully. Thymol-impregnated sheets are preferred for this operation. Complete the interleaving by laying sheets of thymol-impregnated paper over sheets of clean blotting paper and placing these inside the front and back boards. Shut the book and place it on several sheets of absorbent paper without a weight. As drying proceeds, the interleaving sheets can be removed from the book to expose dry sections. Turn the book over each time it is interleaved. When the leaves are almost dry, a light weight may be placed on the book.

If the edges are only slightly wet, a book may be stood on its head and fanned open slightly in the path of a flow of heated air. Alternatively, lightweight books may be hung to dry. To hold distortion of the edges to a minimum, the volumes should be laid flat under light pressure (e.g., paper-covered bricks) just before drying is complete.

If an efficiently air-conditioned room can be established with the capacity to maintain a constant relative humidity of 25 to 35 percent and temperatures between 50° and 65°F, books with only wet edges can be dried successfully in approximately two weeks without interleaving. No attempt should be made to dry books printed on coated stock by this method. In nearly every case, the only chance of saving such materials is to freeze them while wet and return to the dry condition by vacuum or freeze drying.

Final Stages of Conventional Drying. When books are nearly dry, they should be closed and laid flat on a table or other horizontal surface, gently formed into the normal shape, with convex spine and concave fore-edge, and held in place with a light weight.

Drying books should not be stacked on top of each other.

In no case should volumes be returned to the stacks until thoroughly dry; otherwise mold may develop, particularly along the inner margins.

In most cases, manuscripts, drawings, and handcolored prints should be frozen at once and their ultimate restoration left to experts.

No attempt should be made to sponge off mold, since this can be removed more easily when dry. If trained personnel and clean, cold running water are available, loose, single-sheet materials with no soluble components will benefit from washing before freezing.

Where single materials are found in masses, it is usually better not to attempt to separate, but freeze as they are. They will separate easily when vacuum or freeze dried.

Another precaution: do not turn drawers or manuscript boxes upside down to empty them. The wet contents may stick to the container and be torn if handled roughly. Containers and contents should be frozen as found.

Technique for Separating Single Sheets. Although it is usually inadvisable to attempt the separation of single sheets, there are circumstances where freezing is inconvenient or uneconomical. Under these conditions one may wish to separate a wet mass of single items for immediate hand drying. The safest method, which requires considerable skill and dexterity, takes advantage of the special properties of polyester nonwoven fabric and film. Separation is carried out as follows:

1. Dampen a sheet of polyester film (3 mil thickness), and lay it on top of a wet pile of single sheets. The surface energy of water makes it possible for an experienced worker to ease away several sheets at the corner of the pile and roll or peel these back with the polyester. This material and the attached sheets should then be transferred, *polyester side down*, to a nearby table covered with a large polyethylene sheet.

2. Next, place another piece of polyester on top of this newer pile of wet materials. You will find that by careful, gentle manipulation, you can roll the film back with a single wet sheet attached to it. Place this, polyester side down, on a table. Place a piece of dry polyester web over the wet sheet, turn the sandwich over, remove the polyester film and lay on a second piece of dry polyester web.

3. Repeat the entire process, separating wet sheets one at a time by means of the polyester film and interleaving with dry polyester web. If desired, the materials may be safely frozen or air dried at this stage. Note that film should be used for the initial separation. Final interleaving should be done only with web.

4. If the collection is small enough to make hand drying feasible, place each sandwich (web, wet sheet, web) separately on tables or closely spaced nylon lines to dry. By the time 100 of these have been processed, the first sheets will be dry. Be careful that fans do not blow directly on this material. Gentle, warm air may be used, plus good ventilation to remove excess moisture. Air-conditioners or dehumidifiers may also be employed to advantage in drying.

Photographic materials should not be frozen unless they cannot be professionally dried, since the formation of ice crystals may rupture the emulsion layer and leave marks on the film.

Monochromatic Materials. For emergency stabilization, wet, muddy black-and-white negative film and prints should be sealed in polyethylene bags and placed in plastic garbage cans (not metal) under clean, cold running water. Black-and-white negative film and prints can be left under such conditions for up to three days–no longer–before the emulsion will separate from the film backing.

The Eastman Kodak Company provides emergency service for cleaning and drying black-and-white film of all varieties. Local film processors may be prepared to offer a similar service for microfilm and other film materials. Arrangements for cleaning and drying should be made as soon as possible, and the materials should be shipped to the laboratory in cold water. For a trip of several hours it may be necessary to add ice (not dry ice) to the water to keep it cold.

If professional drying cannot be arranged, photographic materials may have to be frozen. In this event, freezing should be as rapid as possible to keep ice crystal size to a minimum.

Color Slides and Color Negative and Positive Film. Unless color materials can be transported to a professional photographic service within 48 hours after immersion in water, colored layers will separate, and the dyes will become weak or will be lost altogether. After this time, the best way to save a large collection is to freeze it until special arrangements can be made.

EVALUATION OF LOSS

When a flood- or fire-damaged collection is covered by insurance, full settlement of a claim cannot be realized until the lost and damaged materials have been listed and their values have been established. The extent and success of possible restoration must also be determined. In the event that a claim is anticipated as a result of such damage, every item should be salvaged, frozen, and dried. After drying, the affected materials should be shelved in a specially equipped environmental storage area, isolated from the main stacks, and there inspected and monitored over a period of time. Such a policy is the best guarantee of sound judgments by custodians, consultants, and adjusters when they must calculate the degree of loss as a basis for compensation.

SUMMARY OF EMERGENCY PROCEDURES

1. Seek the advice and help of book and paper conservators with experience in salvaging water-damaged materials as soon as possible.

2. Turn off heat and create free circulation of air.

3. Keep fans and air-conditioning on at night, except when a fungicidal fogging operation is in process, because a constant flow of air is necessary to reduce the threat of mold.

4. Brief each worker carefully before salvage operations begin, giving full information on the dangers of proceeding except as directed. Emphasize the seriousness of timing and the priorities and aims of the whole operation. Instruct workers on means of recognizing manuscripts, materials with water-soluble components, leather and vellum bindings, materials printed on coated paper stock, and photographic materials.

5. Do *not* allow workers to attempt restoration of any items on site. (This was a common error in the first 10 days after the Florence flood, when rare and valuable leather- and vellum-bound volumes were subjected to scrubbing and processing to remove mud. This resulted in driving mud into the interstices of leather, vellum, cloth, and paper, caused extensive damage to the volumes, and made the later work of restoration more difficult, time consuming, and extremely costly.)

6. Carry out all cleaning operations, whether outside the building or in controlled-environment rooms, by washing gently with fresh, cold running water and soft cellulose sponges to aid in the release of mud and filth. Use sponges with a dabbing motion; *do not rub*. These instructions do not apply to materials with water-soluble components. Such materials should be frozen as quickly as possible.

7. Do not attempt to open a wet book. (Wet paper is very weak and will tear at a touch. *One tear costs at least one dollar to mend!)* Hold a book firmly closed when cleaning, especially when washing or sponging. A closed book is highly resistant to impregnation and damage.

8. Do not attempt to separate single-sheet materials unless they are supported on polyester film or fabric.

9. Do not attempt to remove all mud by sponging. Mud is best removed from clothes when dry; this is also true of library materials.

10. Do not remove covers from books, as they will help to support the books during drying. When partially dry, books may be hung over nylon lines to finish drying. Do not hang books from lines while they are very wet because the weight will cause damage to the inside folds of the sections.

11. Do not press books and documents mechanically when they are water soaked. This can force mud into the paper and subject the materials to stresses which will damage their structures.

12. Use soft pencils for making notes on slips of paper but do not attempt to write on wet paper or other artifacts.

13. Clean, white blotter paper, white paper towels, *strong* toilet paper, and unprinted newsprint paper may be used for interleaving in the drying process. When nothing better is available, all but the color sections of printed newspapers may be used. Great care must be taken to avoid rubbing the inked surface of the newspaper over the material being dried; otherwise some offsetting of the ink may occur.

14. *Under no circumstance should newly dried materials be packed in boxes and left without attention for more than a few days.*

15. Do not use bleaches, detergents, water-soluble fungicides, wire staples, paper or bulldog clips, adhesive tape, or adhesives of any kind. Never use felt-tipped fiber or ballpoint pens or any marking device on wet paper. Never use colored blotting paper or colored paper of any kind to dry books and other documents.

Appendix 1 SOURCES OF ASSISTANCE

The following persons are known to have had actual experience in the salvage and preservation of flood-damaged materials:

Paul Banks
Conservator
The Newberry Library
60 West Walton Street
Chicago, Illinois 60610
(312) 943-9090
Home: (312) 275-7384

Hilda Bohem
Department of Special Collections
University Library
University of California, Los Angeles
Los Angeles, California 90024
(213) 825-4879
Home: (213) 656-7760

George Martin Cunha
Conservation Consultant
33 High Street
Topsfield, Massachusetts 01983
(617) 887-2627

Carolyn Horton
Carolyn Horton & Associates
430 West 22d Street
New York, New York 10011
(212) 989-1471

Robert E. McComb
Physical Scientist
Research & Testing Office
Library of Congress
110 Second Street SE
Washington, D.C. 20540
(202) 426-5607
Home: (703) 360-7889

New England Document Conservation Center
Abbott Hall
School Street
Andover, Massachusetts 01840
(617) 470-1010

Robert M. Organ
Chief, Conservation Analytical Laboratory
HTB ABOTO
Smithsonian Institution
Washington, D.C. 20560
(202) 381-5975
Home: (301) 530-5937

Norman J. Shaffer
Chief, Preservation Office
Library of Congress
110 Second Street SE
Washington, D.C. 20540
(202) 426-5213
Home: (301) 933-7567

William Spawn
Conservator
Library of the American Philosophical Society
105 South Fifth Street
Philadelphia, Pennsylvania 19106
(215) 627-0706
Home: (215) 567-4566

Peter Waters
Restoration Officer
Library of Congress
110 Second Street SE
Washington, D.C. 20540
(202) 426-5634
Home: (301) 977-0240

Marilyn Kemp Weidner
Director
Conservation Center for Art and Historic Artifacts
612 Spruce Street
Philadelphia, Pennsylvania 19106
Home: (215) 627-2303

The Library of Congress will gladly act as an information source for technical advice where needed.

Appendix 2 SOURCES OF SERVICES, SUPPLIES, AND EQUIPMENT

One should check the Yellow Pages of the telephone directory for listings of area representatives of industrial chemical firms for the following products and for others mentioned in the text.

Newsprint (newspaper which has not been printed)
Available from local newspaper publishers or from paper suppliers in rolls or sheets. Purchase of cut sheets, when possible, will save time and labor. "Coarse paper" merchants, who sell shipping room supplies and the like, sometimes sell "stuffing newsprint." Because this is irregularly trimmed, it is not satisfactory for printing and is significantly cheaper than the newsprint sold by "fine paper" merchants.

Plastic garbage cans
Local hardware stores.

Plastic milk boxes
Local supermarkets; milk suppliers.

Polyethylene sheeting and bags
Local hardware stores and garden supply stores. In large cities, special suppliers of plastic films may be located in the Yellow Pages of the telephone directory under "Plastics."

Polyester film
3M
Film and Allied Products Division
3M Center
St. Paul, Minnesota 55101
(612) 733-1110

E. I. du Pont de Nemours & Co., Inc.
Fabrics & Finishes Department
Industrial Products Division
Wilmington, Delaware 19898
(302) 774-2421

I.C.I. America, Inc.
Plastics Division
Wilmington, Delaware 19897
(302) 575-3000

Polyester nonwoven web
E. I. du Pont de Nemours & Co., Inc.
Fabrics & Finishes Department
Industrial Products Division
Wilmington, Delaware 19898
(302) 774-2421

Monsanto Company
Textiles Division
New York, New York 10001
(212) 556-5100

Refrigerated trucks and freezing or cold-storage facilities
Consult the Yellow Pages of the telephone directory.

Recovery of photographic film and slides
In the event that necessary services cannot be located in the area, reprocessing of water-soaked photographic film and slides can be obtained from or through such organizations as those listed below. Arrangements must be made before shipment. Monochromatic film materials should be kept wet and shipped under cold water to the reprocessors as quickly as possible, preferably within 24 hours.

3M
3M Center
St. Paul, Minnesota 55101
(612) 733-1110

Eastman Kodak Company
343 State Street
Rochester, New York 14650
(716) 325-2000

Thymol, ethanol, acetone, industrial denatured alcohol
Chemical supply companies—consult the Yellow Pages.

Section 7: Preservation Microfilming

PRESERVATION FLYER NO.4:BRITTLE BOOK REPLACEMENT DECISIONMAKING

What is Brittle Book Replacement Decisionmaking?
It's the process by which selectors evaluate a brittle volume and determine whether it warrants replacement.

How does it work?
Selectors examine the book and review a completed search form which contains the following information:

1. reproduction of the shelflist card;
2. call numbers and edition statements of other copies and/or editions of the same work owned by The University of Michigan Library;
3. total number of other works by and about the author (and collected/selected works) owned by The University of Michigan Library;
4. results of the search of the Microform Reading Room card catalog;
5. results of the NUC search for other owning libraries;
6. results of the RLIN search for microforms and/or ownership of hard copies;
7. condition information on multi-volume sets;
8. order information for available commercial replacements: reprints and microforms.

After reviewing the book and the search form, what are the selector's options?

A selector's options include:

1. referring it to the Rare Book Room for possible transfer to that collection;
2. not replacing: returning to stacks, transferring to Buhr, recommending withdrawal;
3. replacing with a commercial reprint or microform;
4. ordering an in-house microfilm;
5. ordering a preservation photocopy.

Criteria used in the decisionmaking process include: patterns of use; subject or author importance to The University of Michigan collection; artifactual value; significance of the edition or work; numbers of other editions or copies owned by the University; the presence of illustrative materials which may not reproduce well in microformat; the commercial availability (or unavailability) of the work.

PF4:5-85ne **The University of Michigan Library Preservation Office**

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developing a preservation microfilming program

by pamela w. darling

WHEN a recent series of METRO seminars on the conservation of library materials was first proposed, there were some who wondered why microforms were being given a prominent place in the topics included. Most of the literature about conservation, as well as syllabi for courses in conservation, mention microforms only in terms of "what is the best way to store, preserve and repair them." Such a limited view of microforms is a pity, because several significant voices have been saying for some time that microforms, while they have certain preservation requirements of their own, can perform significant preservation functions appropriate to a broad range of library materials. The voices are growing louder—many had to be turned away from that seminar session—and there is growing recognition of the importance of microforms in a library's conservation activities. But a brief examination of the cause for this delayed recognition of the vital contribution of microforms to the solution of library preservation problems suggests a "first principle" upon which to base a preservation microfilming program.

The reluctance to apply microforms as a tool for preservation can be traced to the old stereotype that "libraries are places for books." Books have been the chief medium for storing and conveying information; and many books possess an intrinsic value-as-object due to their beauty, rarity, associational value, and so forth. But many books derive their value *only* from the information which they contain: it is the information, the intellectual content, which must be retained and made available, not always the physical book. If this distinction between books and the information they contain is not clearly made, the approach to dealing with deteriorating books tends to be "repair, rebind, restore the physical volume." But even if there developed an unlimited pool of skilled repairers, rebinders, and restorers, the costs for physical treatment (still a painstaking handcraft) are so high that it must be reserved for rare and special materials. It would be madness to spend a dollar a page to de-acidify, laminate, and rebind a dog-earred government pamphlet on poultry-raising or a crumbling city directory. We cannot hope to save our collections by physical restoration alone. We can save most of the information in our collections by transferring it to a medium more stable than paper, a medium which precludes the mutilating and tearing out of pages, takes up 90 percent less space to store, can be duplicated easily without damage to the original, and is less likely to be stolen—at least until the hardware people have their way and install microform readers next

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to the TV in every living room. Our "first principle," then, is that information is different than books. Microfilming must be recognized as a vital conservation technique, not because it preserves books (indeed it may hasten their destruction), but because it preserves the information for which those books were originally acquired.

Costs of microforms

Microfilm doesn't come cheap. To use it the library must invest in reading machines and reader-printers; train staff and patrons; and pay for continued maintenance and repair. Sturdy readers for library use run in the three to eight hundred dollar range; reader-printers cost several thousand dollars. One or two printers will suffice for most libraries, but half-a-dozen or more readers may be needed, especially if more than one format must be read—there are roll film readers and microfiche readers and micro-opaque readers, etc. This equipment requires a significant investment, but one which most libraries must undertake quite apart from a preservation program, as more and more materials are published in microform.

As for the costs of microforms themselves, there is no such thing as an "average." It depends, for instance, on whether film is bought from a commercial micropublisher, who can spread production costs among a number of customers, or whether it is made by the library itself. Cost depends on the format, and whether there are extensive bibliographic aids and indexes, internal and external. An example of the buy-it vs. do-it-yourself cost differential illustrates the range: for many years the New York Public Library regularly filmed a certain newspaper, at a cost of between $200-$350 per year for the master negative and one service copy. A commercial micropublisher acquired the micropublishing rights to this particular newspaper, and NYPL now buys a service copy for about $40 a year. (Binding would have cost between $30 and $75 per year, depending on the type; and the paper itself would be well on the way to the dustbin.)

A 400-page book can be bound for $4 to $12, depending on the type of binding needed and assuming that the paper does not require extensive reinforcement; Xerox University Microfilm's books-on-demand project might supply the same book in Xerox hardcopy or microfilm for $20; NYPL could film it in-house for $30; it might be available, singly or as a part of a set from a micropublisher for $3 or $4; it could be deacidified, repaired, laminated, and rebound for several hundred dollars. Are you confused? Microfilm costs and cost-benefits are confusing; they vary considerably, as do prices for physical restoration. But it is generally true that: 1) commercially-produced film is cheaper than binding; 2) inhouse filming costs are higher than binding but considerably cheaper than full restoration; and 3) film has a potential life-span stretching into future centuries while most bound materials will need additional treatment or rebinding every 20-40 years, *if they last that long*—a cost factor which should not be overlooked.

Organizing for microforms

Assume that a library has agreed in principle that a preservation microfilming program should be established, and that a reasonable sum of money is made available for this purpose. The next step must be to assign the responsibility for developing and coordinating this program to someone, somewhere within the administrative structure. In large libraries, able to support full-scale divisions devoted to all phases of the preservation of the collections, the preservation filming function is naturally located within the preservation or conservation division. In other libraries, it would make sense to locate it within the technical services department, possibly within an acquisitions or order unit, but preferably as a special office reporting to the head of technical services. "Preferably," because a comprehensive preservation microfilming program will affect acquisitions and cataloging activities, the physical processing of materials before they are added to the collections, and continuing maintenance long after materials have been turned over to the care of reading room supervisors, stack personnel, and other public service staff. The preservation microfilming officer, therefore, must have the organizational flexibility and authority to work with staff in all of these units, to develop cooperatively policies and procedures which will affect them all, with some hope that they will in fact be implemented.

Once the appropriate organizational unit has been established, someone must be found to run it. Ideally, this person should have an extensive background in microform technology, a broad acquaintance with micropublishing resources, an in-depth knowledge of the library's acquisitions and cataloging procedures, and administrative skills and experience. Since few librarians possess this range of qualifications, find a quick learner with creative organizational abilities, and lock him/her up for a couple of weeks with a good collection of microform literature. (The bibliography included in this ar-

Transformation: Inside the New York Public Library Photographic Service. . .

ticle will provide a starting point.) The budding expert should also visit a photo lab or two, and several libraries with already-established programs; get on the mailing list (i.e., become a member) of the National Microfilm Association; and attend as many meetings of the Reproduction of Library Materials Section of ALA's Resources and Technical Services Division as possible.

The microform work

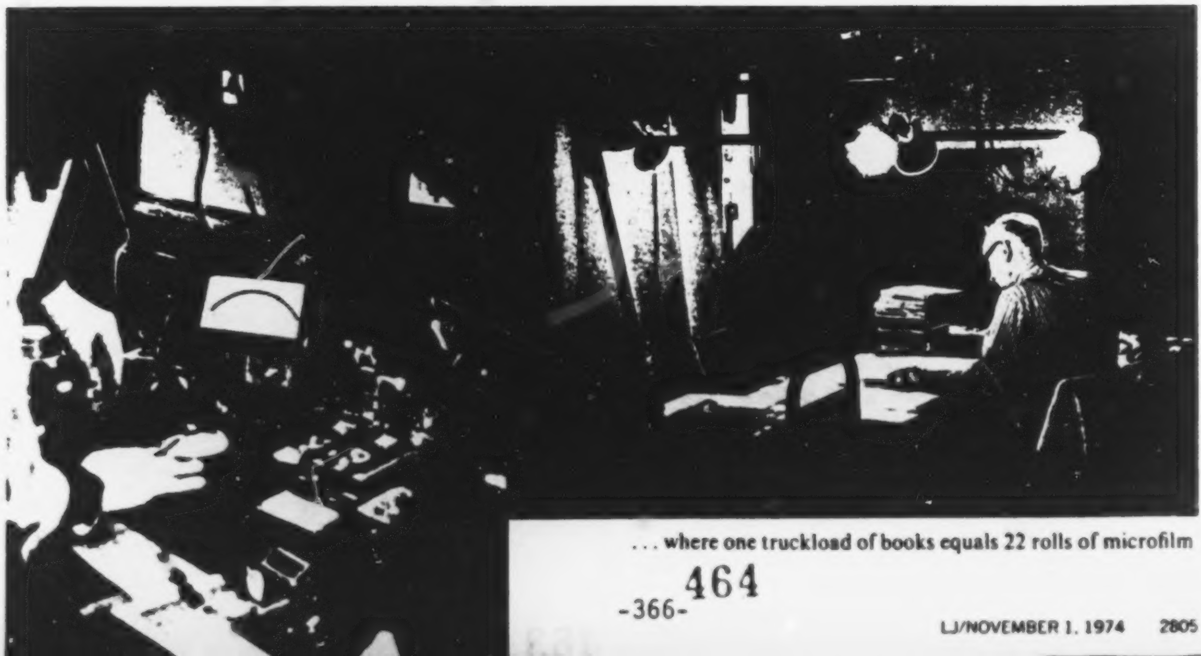
With the initial education process begun (it never finishes), attention can be turned to the actual work. The first step involves the identification of materials which might appropriately be retained on film rather than in original form. This requires adopting policies for various categories of materials, developing guidelines for distinguishing those categories, and implementing procedures for applying those guidelines. Policies might cover such materials as newspaper backfiles, long-run serials, documents and technical reports, and unbound pamphlets. Policies should also cover cataloging and recataloging; the location of film and reading machines; the types of microformats appropriate for different materials, given the library's particular needs; the disposal of originals once the film is available and the keeping of some materials in two formats (for example, maintaining current periodicals in hard copy, with back files in microform; or filming exceedingly rare materials, making the film available for general use and preserving the originals for the use of specialized scholars).

Guidelines based on such broad policies should both spell out in detail the categorical definitions and indicate the exceptions to the general policy which should be anticipated. These guidelines should take into account such things as: size, paper quality, bindability, importance of color or pictorial matter, likelihood of theft or mutilation, usability in microform (a library which circulates scores to music students might not be performing the greatest service by converting them wholesale to microfilm, unless pianos have built-in film readers, or someone can afford to feed quarters into the reader-printer all day), and criteria for weighing an item's value-as-object against present or potential deterioration and restoration costs. Policies and guidelines should address themselves both to materials being added to the collections for the first time and to things which have been quietly self-destructing in the stacks for decades. The problem must be attacked at both ends; otherwise we will either lose the bulk of our retrospective holdings by concentrating on current acquisitions, or create a whole new backlog out of current items which turn into retrospective holdings while we concentrate on the older material.

Priorities must be implicit, sometimes even explicit, in the stated policies and the day-to-day procedures, priorities which must be shaped by the library's service goals, the nature of its collections, the value, uniqueness and condition of its materials, and the availability of funds. Taken together, libraries have enough material that should be filmed to keep all the cameras in the world grinding away from now till 2001, so we'd best order our priorities lest we lose the irreplaceable whilst tending to the dispensable.

The pesky details

After the plans, the policies and guidelines, have been established, the pesky details of day-to-day procedure must be worked out. Procedures for the identification of materials which should be kept in microform might appropriately be developed for several different units within the library. Acquisition and selection officers should be alert to the possibilities of acquiring appropriate items in microform to begin with; the receiving unit should spot new materials on poor quality paper which might be converted to film before being added to the collections; at the bindery preparation stage there should be



... where one truckload of books equals 22 rolls of microfilm a system for determining whether things should be filmed instead; circulation staff should be trained to recognize potential microform candidates. When deteriorated titles must be replaced, the microform market should be searched along with the reprint and out-of-print markets. Shelf surveys, whether systematic or the more normal kind forced upon us by pressing space needs or the sight of crumbling pages littering the floor, should include a mechanism for identifying materials which should be converted to microform. The degree of formality which must be built into such procedures and systems will vary significantly with the size and nature of the library; but at the very least all staff should be made aware of the overall goals and of their role in meeting them.

Getting the microfilm

Along with establishing procedures for identifying materials to be kept in microform must go the simultaneous development of means for getting them in microform. There are three possibilities: buy microforms from a commercial micropublisher or another library; have your copy filmed for you by an outside filming agency; or film your copy yourself.

First, buying microforms: this is almost always preferable to getting something filmed yourself—it's much easier, and most of the time much less expensive because the production costs can be divided among a number of purchasers. You must know where to send the order, so you must search; and since bibliographic control of microforms still leaves much to be desired, this searching can be time-consuming, frustrating and inconclusive. A collection of microform bibliographies and catalogs should be set up, either in connection with the acquisition department's catalogs or in the preservation microfilming office, if there is one. The appendix lists the tools which form the core of the NYPL working collection of catalogs, and outlines the first steps in searching for various types of materials. Reasonable limits to the search should be established, both by ruling out catalogs irrelevant to the title in hand (don't search the 1969 National Register for an item published in 1972), and by limiting the time spent on each. For example, pamphlets of up to 85 or 90 pages could be put on microfiche by a microfilm service bureau for $5-$8; it wouldn't pay to spend many hours searching for such items. On the other hand, a 40-volume serial, or 25 years of a newspaper is worth a long search.

Ordering microforms

Once availability has been determined, place an order. (Depending on the library's policies, general acquisition money might be used, or special microform acquisition funds, book replacement or preservation funds, etc. If there is not a legitimate budget line to charge for such purchases, it should be fought for in the next budget.) The microfilm order should clearly specify the format and quality of film which the library will accept—that is, 35 or 16mm roll films, or microfiche or whatever, indicating maximum reduction ratios acceptable (if your reader magnifies only 20 times and you get film reduced 40 times you're in trouble), your choice of negative or positive polarity, whether you insist on silver halide film or will accept diazo or vesicular film, and a general statement to the effect that the film should conform to all appropriate national standards for archival quality and bibliographic integrity. A careful study of published standards and specifications will simplify the task of developing an order statement. Although many outside sources of film can be trusted to conform to standards without being told, there are others for whom such instructions may not be superfluous. In addition, because publisher's catalogs often give very few technical facts about the film they are offering, the instructions relating to format, reduction, and so on may be crucial.

Once the film arrives, check it carefully. Make sure that what's on the reel agrees with the box label and that both agree with the order; be sure the film is of the type specified. Study Allen Veaner's booklet, *The Evaluation of Micropublications* and do as much of the technical inspection he describes as the library has the staff and equipment for, particularly if this is the first film received from a company. Frame by frame inspection is a luxury few can afford; but examination before the invoice is paid can save a lot of trouble later on if the sixth fiche card out of 20 turns out to be missing, or if volume 5 turns up on the reel between volumes eight and nine.

Outside filming

If the material wanted is not already available in microform, consider getting your copy filmed. If there is no in-house filming laboratory, search out a microfilm service agency. The *Microfilm Source Book* and the NMA's *Buyer's Guide* list many of these firms with indications of the type of filming they can do. After locating an agency, DO NOT pack up everything and send it off to be filmed. Sit down with the company's technical director—not the sales representative—and go over in great detail the technical and bibliographic specifications for the product to be delivered. If the library has not developed such specifications tailored to its own needs, the Library of Congress specifications will cover most of the ground. When you feel confident that they understand your needs and you understand their capabilities, and if the two seem compatible, select a representative batch for a pilot project. When this comes back, examine it *rigorously*—if the library does not have all the necessary equipment for testing density, resolution, residual hypo, etc., find another lab, preferably in a library, that can do these tests. (There will probably be a fee, but it's worth it.) If the results are satisfactory, establish a schedule for sending out work and spot-testing the returns; determine an acceptable percentage of error and agree in advance on who shall pay for necessary remakes. Maintain close personal contact with the people doing the work. If the first test results are not satisfactory, sit down with the technical director again and go over the problems thoroughly. Repeat the pilot batch and again examine the results. It may take months to get the quality product needed; it may be necessary to give up on one service agency and start over with another. Many microfilm service agencies were set up to film bank checks, computer print-outs, office records—fairly uniform materials which do not present anything like the range of filming problems which library materials present, and which usually do not require the bibliographic apparatus essential for good library service. Some can learn, and learn fast, particularly if the library can muster enough technical knowledge to clearly identify the problems and explain the requirements. But be aware of the pitfalls, and plan on a significant start-up time. Whatever you do, don't sign a contract until you know the firm can produce what you want.

Do it yourself

The third alternative for getting things on film is to do it yourself. This is not an alternative available to everyone; the latest *Directory of Library Reprographic Services* lists only 242 libraries, some of which do little more than make Xerox copies. The investment in costly equipment and skilled personnel is significant and can probably be justified only if a steady volume of filming can be guaranteed for years to come. This is not the place to describe in detail the essential ingredients of a good lab; but if the library has, or can set up, an in-house laboratory, be as rigorous about inspection and quality control with yourself as you would be with an outside service

LOCATING MATERIALS IN MICROFORM

The tools described below, while by no means all the available catalogs, make up a core collection for searching out titles available in microform. A suggested beginning sequence for different forms is indicated here, but should not be thought a comprehensive searching strategy. Most micropublishers issue periodic catalogs, some general and some in specific subject areas, which should be assembled and searched as appropriate.

A final report is to compare the holders of the desired title listed in the *National Union Catalog* with the *Directory of Library Reprographic Services*. Many large libraries can microfilm materials from their own collections on order, with the customer usually absorbing the full costs of the filming.

Initial Searching Sequence

Monographs

1) *National Register of Microform Masters*, 1970 to date
2) *Guide to Microforms in Print*
3) *Books on Demand*

Serials

1) *National Register of Microform Masters*, 1969 to date
2) *Guide to Microforms in Print*
3) *Serials in Microform*

Newspapers

1) *Newspapers in Microform*
2) *Newspapers on Microfilm and Special Collections*
3) *Guide to Microforms in Print*
4) *Serials in Microform*

Major Microform Bibliographies and Catalogs

Books on Demand: a Catalog of OP Titles. The 1971 edition plus supplement includes roughly 60,000 out-of-print titles, primarily monographs, which are available either on 35mm film or as bound photocopies. Write for catalogs from: Xerox University Microfilms, 300 North Zeeb Rd., Ann Arbor, Mich. 48106.

Guide to Microforms in Print. A *Books-In-Print*-type listing of monographs, serials and newspapers in microform being actively marketed in the United States, primarily by commercial publishers but also by some libraries. The 1973 edition contained about 25,000 titles, arranged by main entry for monographs and serials, by state and city for newspapers. The current edition lists at $6 and may be ordered separately or on a standing order basis from: Microcard Editions Books, 901 26th St., Washington, D.C. 20037.

National Register of Microform Masters. Published by the Library of Congress, it includes reports of master microforms of monographs and serials held by various libraries and commercial firms, from which copies can be made. The publishing history of the Register is complex: the issues from 1966-1968 are arranged primarily by LC card number, which is *not* convenient for searching. The 1969 issue is arranged by main entry, includes only serials, and cumulates the serial entries from 1966-1968. There is no cumulation of the 1966-1968 monograph entries. The 1970, 1971, and 1972 annuals include serials and monographs, arranged by main entry, as will the 1973 annual which was scheduled for publication during the winter of 1974. Prices: 1969, $5; 1970, $12.50; 1971, $25; 1972, $25 (when published); *Free* to subscribers of the *National Union Catalog*. Available from: Card Division, Library of Congress, Building 159, Navy Yard Annex, Washington, D.C. 20541.

Newspapers in Microform. Supersedes the old *Newspapers on Microfilm* publishd by the Library of Congress. The United States section includes 34,000 reports, from 1948-1972, plus an extensive index. The foreign countries section contains almost 9000 reports, also from 1948-1972. There will be supplements. Price: *Newspapers in Microform: United States, 1948-1972*, $30; *Newspapers in Microform: Foreign Countries, 1948-1972*, $10. Available from: Card Division, Library of Congress, Building 159, Navy Yard Annex, Washington, D.C. 20541.

Newspapers on Microfilm and Special Collections. An annual catalog listing over 5000 newspapers, primarily from the United States, a few serials, and a number of "special collections." Available from: MicroPhoto Division, Bell and Howell, Old Mansfield Rd., Wooster, Ohio 44691.

Serials in Microform. An extensive list (600 pages of title entries, plus an 80-page subject index) of serials available on microfilm. The current cumulation has a list price of $4.95, which includes periodic supplements. Available from: Xerox University Microfilms, 300 North Zeeb Rd., Ann Arbor, Mich. 48106.

agency. There are several advantages to having this in-house capability: there is less risk of damage or loss of valuable materials, much closer control can be exercised over all phases of the film process, and the laboratory staff can develop a high degree of expertise specifically tailored to the peculiarities of filming library materials. Since in-house costs tend to be higher than commercial costs, it may be well to divide the work, sending routine items outside and reserving the in-house lab for fragile, difficult-to-film materials. It will also be important to establish a balance between preservation microfilming and other kinds of photoduplication services which may be offered to readers, to the library administration, or to the world at large.

Preparing materials for film

Time and effort must go into preparing materials for filming, whether in-house or by a service agency. Every reasonable effort should be made to film a complete copy. This means a page-by-page collation to be sure that sections are in the proper order and to identify missing pages or issues. Wherever possible, such gaps should be filled before filming—by borrowing copies from other libraries, dunning publishers for missing volumes, etc. Gaps which cannot be filled must be clearly indicated on the film, through the use of contents targets, missing or mutilated page statements and other explanatory notes. The Library of Congress specifications provide excellent guidance. Unless the original is to be retained after filming, it is often better to remove the binding so that the pages can lie completely flat on the camera board. This can be done by guillotining or, if the paper is too brittle for such treatment, by carefully taking the volume apart by hand. In some cases, this will be unnecessary: newspapers, unbound single-signature pamphlets or magazines such as *Time*, or bound materials with very wide gutter margins may lie perfectly flat without cutting. In other cases the book may be so badly deteriorated that handling should be kept to a bare minimum—just get it gingerly onto the camera board or book cradle and hope that the pages will stay in one piece long enough to be photographed. Process records should be kept, like bindery process files, to facilitate the location of materials and permit follow-up on delinquents mislaid in someone's lab; and such records could be built into the next stage of cataloging procedures. Such preparation and record-keeping take time and require trained staff. The initial planning should be done at the professional level, but most of the daily routine can be carried out by library technical assistants or other nonprofessional staff.

Cooperative efforts

There is actually a fourth alternative for getting materials on film, and that is to cooperate with micropublishers who plan to market microform copies. In most such cases, the library will receive free film in return for the loan of the original material; reprint fees or royalty payments on sales are sometimes involved. Such arrangements can be of great benefit to the library, *if* they are entered into cautiously and carefully, without giving a single firm exclusive access to the library's collections and provided that such cooperation does not interfere unduly with the library's own priorities.

In most instances, once materials to be kept in microform have been identified, and in one way or another the microforms have been obtained, the original materials may then be disposed of (unless they are so valuable they should be restored and kept for restricted use in a rare book or special collection). Materials being added to the collections for the first time can be cataloged straight off as microforms. Previously cataloged materials which have now changed format may be completely recataloged, or the original records may be annotated to indicate the change. All cataloging decisions, including classification schemes or location number systems should be determined in advance, particularly if the library is having its own materials filmed rather than purchasing from outside. It may be, for instance, that the microform call number is to be included in the eye-legible header of the microfiche, or on the title target of the roll film—if so, it's much easier to build that into the initial preparation of materials for filming than to set up a labeling system for adding the number to the completed film.

If the library has filmed its own material, and therefore owns master negatives in addition to service copies, they should be reported to the *National Register of Microform Masters* so that others will be spared the unnecessary expense of duplicate filming. It is a simple procedure (instructions appear in the introductory pages of the Register) but is too often ignored or done in a haphazard way. In the face of the gigantic tasks before us we cannot afford not to support and expand this important tool—nothing is more discouraging than to spend $1000 filming a large back file only to discover that another library filmed it years ago and could have sold a print for $100. Libraries actively seeking to sell copies of their microforms should also list them in the *Guide to Microforms in Print*, being sure there are no copyright limitations first. It is not essential to have an in-house laboratory in order to provide copies for others. Most microfilm service agencies will store masters for their customers, reproducing them on request, and duplication costs are only a fraction of the original filming costs.

Microforms can play a tremendous role in preserving the information, the intellectual contents, of a great proportion of library materials, both current and retrospective. If properly stored and handled, microforms will last as long as acid-free 100 percent rag paper—several hundred years—which is six to ten times longer than most book papers used since the mid-19th Century. If the master negative is kept under archival conditions, the material will never again be "out of print."

But a word of caution: don't be fooled into thinking that a secondhand camera and an automatic processor installed in the coat closet equal an instant preservation microfilming program. This is approximately equivalent to renting a computer terminal and calling it an automated cataloging system. The same sort of careful analysis and program development that is essential for automation is needed to establish a feasible preservation microfilming program. The technology is not as complex, of course; but it demands respect and attention to detail, both technical and bibliographic. If we plunge in thoughtlessly we may end up with miles of film which is self-destructing due to improper processing, or whose contents are inaccessible because of inadequate internal and external bibliographic control. But if we take the time to learn what it's all about and to make the technology work to meet our needs, we may yet save the millions of volumes which will otherwise crumble to dust on our shelves before this century is over.

BIBLIOGRAPHY

This list, an expansion and updating of the bibliography issued in June 1973, by the ALA/RTSD Micropublishing Projects Committee, provides an introduction to the proliferating literature on microforms and microform equipment. Many items cited here contain bibliographies leading the reader to more extensive treatments of particular topics. (Items listed in the boxed material within the article are not repeated here.)

General

Hawken, William R. *Copying Methods Manual*. Chicago: Library Technology Program, American Library Assn. 1966. Covers reproduction processes in general and gives considerable space to microforms with a description of each format. May provide more than the beginner wants to know, but illustrations and evaluations of different formats are useful. Glossary.

Microfilm Source Book. Microfilm Pub., 1971-. An annual volume containing indexes to products, trade names, associations, micropublishers, service bureaus, consultants, storage centers, distributors, publications, and free literature. Available: Microfilm Publishing, Inc., P.O. Box 313 Wykagyl Sta., New Rochelle, N.Y. 10804.

National Microfilm Association. *Glossary of Micrographics*. 1973. An industry standard, containing over 1000 terms, including trademarks and trade names. $4 to NMA members; $5 to others.

________. *Introduction to Micrographics*. Silver Spring, Md., 1973. Describes the common formats and equipment used to make and reproduce microforms. Well illustrated, with glossary. $1.

________. *A Microform Handbook*. Silver Spring, Md., 1974. 128 pages on selection, acquisition, and use of both software and hardware, written by Dale Gaddy of the American Association of Junior and Community Colleges, under a contract from the Office of Education. Includes several other NMA publications in appendix. $5.

Nitecki, Joseph Z., ed. *Directory of Library Reprographic Services*. 5th ed. Weston, Conn: Microform Review, 1973. Sponsored by the Reproduction of Library Materials Section of RTSD/ALA; a listing of 242 libraries offering various microform and full-size copying services; charts indicate types of services available, approximate costs, full addresses (including NUC and TWX codes), and a handy glossary of common terms. Available: Microform Review, Inc., Rogues Ridge, Weston, Conn. 06880.

Rice, E. Stevens. *Fiche and Reel*. Rev. ed. Ann Arbor, Michigan: Xerox University Microfilms, 1972. This free booklet is well illustrated and designed to answer questions on scholarly micropublishing frequently asked by librarians, educators, scholars, and others.

Spigai, Frances G. *The Invisible Medium: the State of the Art of Microform and a Guide to the Literature*. ERIC, in cooperation with the ASIS Special Interest Group on Reprographic Technology, 1973. In three sections; the first covers aspects of micropublishing, the second provides an overview of equipment, the third contains a select guide to micrographic literature. Available: American Society for Information Science, Suite 804, 1140 Connecticut Ave., N.W., Washington, D.C. 20036. $3.50.

U.S. Library of Congress. *Specifications for Microfilming of Newspapers in the Library of Congress*. 1972. Prepared by LC's Photoduplication Service as a procedural guide and to establish criteria "to evaluate microfilms under consideration as additions to the Library's permanent collections." Available: Superintendent of Documents, GPO, Washington, D.C. 20402. Stock Number: 3000-0055; 30¢.

________. *Specifications for the Microfilming of Books and Pamphlets in the Library of Congress*. 1973. A companion volume to the specifications for newspapers. GPO Stock Number: 3000-00068; 40¢.

Veaner, Allen: *The Evaluation of Micropublications*. Chicago: Library Technology Program, American Library Assn., 1971. Written specifically for librarians and others responsible for acquiring and/or evaluating micropublications. Covers technical and bibliographic aspects of micropublishing, microreproduction, and methods of inspecting microreproductions.

Veaner, Allen B. & Alan M. Meckler. *International Microforms in Print, 1974-75*. Weston, Conn., Microform Review Inc., 1974. A listing of over 6000 titles available in microform from non-US micropublishers.

________. *Microform Market Place, 1974-75*. Weston, Conn., Microform Review, Inc. 1974. A first attempt at an "international directory of micropublishing," this includes listings of micropublishers and libraries providing photographic service, a subject index, bibliography, directory of organizations, and a names and numbers section to facilitate direct personal contact. While much of the information is available in other published sources, it is gathered together here in a single volume; the subject index might prove particularly useful in tracking down those who produce, or might be interested in producing, microforms in specialized areas.

Equipment

American Library Association. Library Technology Program. *Library Technology Reports*. 1965- . A full section is dedicated to ongoing evaluation of microform readers and reader-printers. Compilations of equipment features in tabular form are helpful in making comparisons. Illustrated evaluations are extensive and cover such areas as operator-machine relationships and hazards as well as technical details.

National Microfilm Association. *Buyer's Guide to Microfilm Equipment, Products and Services*. 1971- . Annual listing of Sustaining Members of NMA by product and service; designed as a concise introduction and continuing reference for present and potential users of microform equipment, products and services. Free.

________. *Guide to Microreproduction Equipment*. 1st ed.; 1959- . Under the editorship of Hubbard Ballou, an essential reference for information on specifications and capabilities of cameras, readers, reader-printers, processors, contact printers, enlargers, accessories (e.g. film splicers, storage equipment), computer output microfilm, and specialized microform retrieval systems. Arranged by equipment categories and manufacturer; information is descriptive, not evaluative. The 5th ed., 1971, is supplemented by *The 1972 Supplement to the Guide* . . .; previous editions are still useful for information on older models still in use. 1971 edition, $17.50 to NMA members, $21 to nonmembers; 1972 supplement, $6.50 to NMA members, $8 to nonmembers; package price for both, $21 to NMA members, $26 to nonmembers.

________. *How to Select a Reader or Reader-Printer*. Silver Spring, Maryland, 1974. Twenty-page illustrated consumer guide; provides description of various features available. $2.

Journals

Foreign Newspaper and Gazette Report. An occasional newsletter issued by the Coordinator of LC's Foreign Newspaper and Gazette Microfilming Project; includes progress reports from the ARL Foreign Newspaper Microfilming Project, information on new publications. Available: Central Services Division, Library of Congress, Washington, D.C. 20540. Free.

Journal of Micrographics (formerly *NMA Bulletin*), Vol. 1- ; Fall 1967- . Professional journal containing technical articles, systems and case studies, scientific communications, standards, book reviews and other material of interest to the field. Originally a quarterly; bimonthly since 1971. Library subscriptions: $20; NMA membership includes subscription.

Library Resources and Technical Services. For some years the Spring issue has carried a review of micrographic events, products, and literature of the past year.

Microform Review. Vol. 1- ; January 1972- . Articles, comments, news items, numerous reviews of micropublications, cumulative author-title index to microform reviews, materials in simultaneous publications; clearinghouse section listing recently completed microform projects. Available: Microform Review, Inc., Weston, Conn. 06880. $20 a year for printed or microfiche format; $30 for both.

Note: All NMA publications available from: National Microfilm Assn., Publications Sales, 8728 Colesville Rd., Silver Spring, Md. 20910.

SEARCHING FOR AVAILABLE REPLACEMENT COPIES: SOURCES

(an update to and expansion of "Locating Materials in Microform" from Pamela W. Darling's "Developing a Preservation Microfilming Program," Library Journal 11/1/74)

HARD-COPY REPLACEMENT SOURCES

Books in Print (New York: Bowker, annual editions) and Paperbound Books in Print (New York: R.R. Bowker, spring and fall editions).
arrangement: authors, titles, subjects in separate alphabets.
scope: a list of books available in the U.S. from U.S. publishers or distributors; not an absolutely comprehensive source, since it is an "index to the Publishers' Trade List Annual."
information provided: author, title, publisher, International Standard Book Number (ISBN), edition, price; entries may vary in spelling.

Guide to Reprints (Kent, CT: Guide to Reprints, Inc, annual editions).

arrangement: alphabetical by main entry.
scope: titles available from reprint houses; reprints are defined as "materials that have gone out-of-print and are now back in print by virtue of a photo-offset process."
information provided: author, title, original and reprint, publisher, ISBN or International Standard Serial Number (ISSN), edition, original publishing date, reprint date, price; not all entries are actually available from reprinters.

Books on Demand (Ann Arbor, MI: University Microfilms International, irregular updates); available in hardcopy or fiche format.

arrangement: by authors.
scope: formerly out-of-print titles (monographs, specifically) now available from UMI as paper copies or as 35mm or 16mm microfilm.
information provided: author, title, publisher, date of publication, price; some coding of numbers (AG3-200 or AG3-2000 numbers) indicates that these are paper print masters and have better quality illustrations.

Books in Series in the U.S. (New York: Bowker, 2nd ed., 1979.).

arrangement: by series.
scope: original, reproduced, in-print, and out-of-print books published or distributed in the U.S. by popular, scholarly, and professional series.
information provided: author, title, publisher, series, date of publication.

British Books in Print (London: J. Witaker & Sons, Ltd., annual editions).

arrangement: authors, titles, subject, in one alphabet.
scope: a list of books available and sold in the U.K.
information provided: author, title, subtitle, volume or part, size, number of pages, illustrations, edition, series, binding -- if cloth, price, publisher, date of publication, ISBN.

Canadian Books in Print (Toronto: Univ. of Toronto Press, quarterly) with one hard copy edition per year, updated by three fiche editions yearly.

arrangement: author and title in two alphabets; separate annual subject indexes.
scope: books published in Canada in English and French.
information provided: author, title, publisher, edition, ISBN.

Les Livres Disponibles: French Books in Print (Paris: Cercle de la Libraire, annual editions).

arrangement: author and title in two alphabets.
scope: books published in the French language.
information provided: author, title, date, publisher, pagination, volume, size, price, ISBN.

Verzeichnis Lieferbarer Bücher: German Books in Print (Frankfurt am Main: Buchhandler-Vereinigung GmbH, annual editions).

arrangement: author, title, "und Stichwortregister" in one alphabet).
scope: German language books from the Federal Republic of Germany, Austria and Switzerland.
information provided: author, title, publisher, pagination, volume, size, price, ISBN.

Libros en venta en Hispanoamerica y Espana (San Juan, Puerto Rico: Melcher Ediciones, irregular).

arrangement: author, title in two alphabets.
scope: spanish language books in print.
information provided: author, title, place, publisher, price, pagingation.

Libros Espanoles en Venta (Madrid: Instituto de Cultura, Instituto Nacional del Libro Espanol, annual editions).

arrangement: author, title subject in three alphabets.
scope: Spanish language books, with concentration on publicaitons from Spain.
information provided: author, title, publisher, price, pagination, size, ISBN.

Catalogo dei libri in commercio (Milan: Editrice Bibliografico Associazione Italeana Editori, annual edition).

arrangement: author, title, subject in three alphabets.
scope: Italian language books from Italy and elsewhere.
information provided: author, title, date, size of volume, pagination, publisher, price.

MICROFORM REPLACEMENT SOURCES

National Register of Microform Maters (NRMM) (Washington, DC: Library of Congress, 1965-75 cumulation, annual volumes for 1976-1983.

arrangement: alphabetical by main entry, Library of Congress cataloging.
scope: monograph and serial titles available from noncommercial and commercial sources.
information provided: author, title, publisher, place, date, source; no prices are given; information is provided on generally only "preservation masters" although by inference service copies are usually available.

Serials in Microform (Ann Arbor, MI: University Microfilm International, yearly catalog).

arrangement: alphabetical by title.
scope: over 13,000 titles, with many indicated with an "inquire" entry when the publisher has had insufficient orders to create a master for its file; masters meet national standards for archival quality; nonsilver film is available for discount over silver film; only service positives are available.
information provided: title, dates of publication, volumes, ISSN, cost per reel, and cost of entire run. The phrase "previously published as" is used for some titles that appear as parts of other UMI collections. For examples, the "A" symbol indicates that the title is part of the American Periodical Series; "B" indicates a part ot the British Periodicals I series; and so on. The library may already hold these titles in microform as part of one or more of these series.

Newspapers in Microform: United States. (Washington, DC: Library of Congress, volumes for 1948-72, 1973-77; and yearly thereafter);

and

Newspapers in Microform: Foreign Countries (Washington, DC, Library of Congress volumes for 1948-72, 1973-77, and yearly thereafter.

arrangement: main entry for newspaper titles within state or country, indexed by title.
scope: newspapers microfilmed and reported to NUC by libraries and others in the U.S. and Canada.
information provided: institutional or commercial publisher where film is available, format of microform, no price given.

Guide to Microforms in Print (Westport, CT: Meckler, annual edition and supplement).

arrangement: author and title in one alphabet, subject in another.
scope: titles (serial, monographs, sets) that are available to be purchased from commercial and some non-commercial sources in the U.S., Canada and abroad.
information provided: brief entry, ISBN or ISSN, format, cost; for microform sets, little information is available on what contents of individual reels are; there are some "apply" notations, indicating that the title has not been filmed and that the publisher is waiting for sufficient number of orders.

New York Public Library Register of Microform Masters: Monographs. (New York: New York Public Library, The Reasearch Libraries, 1983).

arrangement: alphabetical by main entry on 128 fiche.
scope: monographs (including many pamphlets) microfilmed by the library and available for sale by the library; 190,000 titles included.
information provided: author, title, place, publisher, pagination, date; information varies; master negative numbers often indicated, for ordering from the library's Photographic Service; No prices are listed.

Research Libraries Information Network (RLIN) online database (available through the Research Libraries Group, Jordan Quadrangle, Stanford, CA 94305). See also RLG Preservation Union List.

arrangement: access points include author, title, subject, series, corporate/conference name, Library of Congress card number, classification number, ISBN, ISSN, microfilming queuing date.
scope: incorporates bibliographic records of commercial microforms purchased and cataloged by RLIN users and master negatives produced by RLG members, as well as some Library of Congress holdings; may include some master negatives produced by users of OCLC database through a tape exchange agreement.

information provided: main entry, title, edition, imprint, pagination, number of reels or microfiche, Library of Congress card number, institutional location, microform physical description, "queuing date" for items scheduled for filming, holdings statement for serials.

RLG Preservation Union List (Stanford, CA: Research Libraries Group, irregular).

arrangement: author and title in one alphabet.
scope: microform masters held by RLG institutions, copies of which are available for purchase or loan, and titles scheduled for filming.
information provided: main entry, edition, imprint, pagination, number of reels, Library of Congress card number, holding library, microfilm physical description, "queuing date" for those items scheduled for filming, holdings statement for serials.

Union List of Microfilms (Philadelphia Bibliographical Center and Union Library Catalog; Two volumes: 1942-49, 1949-59.

arrangement: alphabetical by main entry.
scope: predecessor to the National Register of Microform Masters; 77,000 mainly rare book and pamphlet items in microform, available from institutional sources. No longer available, but for repositories that have it, best used for pre-1850 imprints or manuscript collections.
information provided: author, title, date and place of publication, source and type of microform.

Books on Demand (Ann Arbor, MI: University Microfilms International, annual editions); available in hard copy or fiche format.

arrangement: alphabetical by author.
scope: formerly out-of-print titles (monographs, generally) now available from UMI as paper copies or as 35mm or 16mm microfilm.
information provided: author, title, publisher, date of publication.

Microform Annual: An International Guide to Microforms (Elmsford, NY: Microforms International Marketing Corporation and Oxford Microform Publications, annual cumulations).

arrangement: broad subject arrangement of items available from Pergamon Press; journals are in seperate list arranged by publisher.
scope: a listing of scholarly journals and research collections published in microform.
information provided: title, place of publicaton, dates of publication, dates available for purchase, format, price.

Center for Research Libraries Catalog (Chicago; 1982, with supplement planned); microfiche; tapes available to load onto local online catalogs.

arrangement: alphabetical by main entry.
scope: holdings of Center, including microform holdings.
information provided: author, title, place, publisher, date, pagination, CRL access number.

Guide to Russian Reprints and Microforms (New York: Pilvex Corp., 1973).

arrangement: main entry in one volume, with no recent editions.
scope: Russian books in reprint, with some microforms. There are no updated additions, but many titles are still available.
information provided: author, title, date and place of publication.

Online Computer Library Center (OCLC) online database (available through OCLC, 6565 Frantz Road, Dublin, OH 43017-0702).

arrangement: access point include author, title, Library of Congress card number, ISSN, ISBN, series, corporate/conference name.
scope: incorporates some bibliographic records of microforms purchased or produced and cataloged by OCLC users; may include microforms produced by userd of the RLIN database through a tape exchange.
information provided: author, title, publisher, place, date, source; no prices are given; information is provided only of "preservation masters," although by inference service copies are usually available.

National Union Catalog: Books. (Washington, DC: Library of Congress, 1983-, monthly, with cumulations through the year). Starting in 1983, includes entries for microforms of monographs that formerly went to the National Register of Microform Masters.

arrangement: register and index format; register provides full bibliographic data. Access to register is provided by indexes (name, title, subject, and series) which display a shortened version of the record.
scope: bibliographic or catalog entries prepared by the Library of Congress or by a reporting library. Includes monographic microform publications (both microform re-issues and items originally issued in microform).
information provided: full bibliographic record in register, which includes type and source of microform.

Association pour la Conservation et la Reproduction Photographique de la Presse (ACRPP). Catalogue de microfilms repoduisant des periodiques. (Paris: 1984-85, No. 13, irregular updates). Available from the Association at 4 Rue Louvois, 75002 Paris; also available fron U.S. distributor Clearwater Publishing, 1995 Broadway, New York, NY, 10023, (800) 231-2266.

arrangement: alphabetical by title, in several alphabets.
scope: primarily French language periodicals from the late 18th century to the late 20th century on microform.
information provided: title, date and place of publication, price.

Detailed bibliographic and replacement searching can be time-consuming process. Estimates for such searches average about 20 minutes or more per title for full searches, perhaps 7-10 minutes for all microformat replacement searches. For this reason, it is very important to maintain files on previous searching done in this process, on order to avoid expensive duplicate searching, and to avoid overlooking an important microform replacement source. Every effort must be taken to locate and purchase existing microform rather than create duplicates, especially for extensive serial holdings.

Suggested Order for Searching Replacement Tools

To facilitate the searching process, search for replacements in the order suggested here. Search sources are arranged in a ranking based on institutional experience, of those that most frequently contain citiations for replacements, with the most comprehensive tools first.

FOR MICROFORM REPLACEMENT:

Serials:

- Online bibliographic databases (RLIN, OCLC, etc.)
- Serials in Microform (SIM)
- National Register of Microform Masters (NRMM): 1965-75 cum., then annual volumes through 1983.
- Guide to Microforms in Print (GMIP) and its Suppl.
- New Serial Titles
- Microform Annual
- Others

FOR PAPER COPY REPLACEMENT:

Serials:

- Guide to Reprints (GTR)

Newspapers Online bibliographic databases Newspapers in Microform (NIM) NRMM SIM GMIP & Suppl.	Newspapers:
Monographs Online bibliographic databases NRMM NYPL Register of Microform Masters: Monographs Books on Demand GMIP & Suppl.	Monographs: Books in Print (BIP), it Suppl. & international editions Guide to Reprints Books on Demand Others

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Costs Associated with Preservation Microfilming: Results of the Research Libraries Group Study

Patricia A. McClung

In 1984 seven RLG institutions conducted a study of the times and costs involved in the Cooperative Preservation Microfilming Project. The study covered twelve steps, including the identification and physical preparation of materials, filming and inspection, recording on the Research Libraries Information Network, cataloging, and storage. The results, which varied significantly among the seven participants, constitute valuable data for other institutions planning preservation microfilming projects.

In 1983 the Research Libraries Group (RLG) was awarded $1,300,000 in equal amounts from the National Endowment for the Humanities and the Andrew W. Mellon Foundation for a Cooperative Preservation Microfilming Project (CPMP). This project grew out of the efforts of the RLG Preservation Program Committee to address in a cooperative way the problems of deteriorating brittle materials in research libraries.

From its inception the CPMP had several goals. The first was to capture the intellectual content of a significant portion of endangered American imprints or Americana on archival quality microfilm before it had deteriorated completely. The second was to make the information about these materials widely available to the scholarly community by using recently adapted capabilities of the Research Libraries Information Network (RLIN) online database to emphasize preservation information. And third, RLG hoped to develop a management model for cooperative preservation microfilming by evaluating and documenting procedures, developing guidelines, and studying costs. *The RLG Preservation Manual* includes the guidelines and procedures developed for the project, as well as information on the RLIN system enhancements designed to facilitate bibliographic searching for microforms.[1] This paper reports on the cost study conducted during this project.

Patricia A. McClung, Associate Director for Program Coordination, Research Libraries Group, gratefully acknowledges the assistance of the project managers who conducted this cost study and commented on the article: John Baker, Sherry Byrne, Margaret Byrnes, Rosemary Cullen, Carolyn Harris, Don Kelsey, Barclay Ogden, and Gay Walker. She acknowledges also the assistance of Jim Coleman and Maureen Thayer in tabulating and analyzing the data.

THE COOPERATIVE PRESERVATION MICROFILMING PROJECT

Based on a survey of potential interest sent to all RLG members, seven institutions were selected to participate in the project, which was carried out over a three-year period. (An eighth institution, Stanford University, joined the project during its final year, after the cost study had been completed.) Early in the planning stages the RLG Preservation Committee decided to focus on American imprints and Americana published between 1876 and 1900, the rationale being that the project could have the most immediate impact by beginning with our nation's own literature. Approximately thirty thousand titles have been filmed as part of this project in the following subject areas:

Selected American poetry volumes from the Harris Collection at Brown University

Selected American literature, philology, and language from the collections at Columbia University

Selected Americana in philosophy and religion, cultural anthropology, law, and medicine from the collections of the New York Public Library

Selected American imprints on the history of the physical sciences from the collections of Stanford University

Selected imprints in American history of the Trans Mississippi West from the Bancroft Library and the general collections of the University of California–Berkeley

Selected Americana in economics, sociology, political science, and technology from the collections of the University of Michigan

Selected titles from the Hess Collection of Dime Novels at the University of Minnesota

Selected titles in American history (except Trans Mississippi West) from the collections of Yale University

The CPMP represented a unique opportunity to measure similar procedures, performed according to agreed-upon guidelines, in a wide variety of institutional settings and geographic regions. From the beginning, the project participants assumed certain responsibilities for record keeping and quality control because of the project's emphasis on designing a national model for cooperation. Besides the production of replacement copies for deteriorating items in these institutions, the project was intended to create a national resource of archival quality master negatives accessible through excellent bibliographic records and stored under optimal conditions. The hope was that any additional costs incurred in pursuit of these goals would be offset over time by the fact that other institutions would not need to duplicate these efforts and could devote their resources to preserving additional materials in the same spirit of cooperation.

In 1984 the project managers for the CPMP conducted a study of the costs involved in carrying out this project in their institutions. The study focused on twelve steps in the process from selection through preparation, filming, and cataloging to the point at which the master negatives were shipped to storage. Each of the seven institutions conducted the study twice, once in April 1984 and again that November. The institutions gathered data on the costs and the time necessary to complete each of the twelve steps for a different fifty titles each time the study was conducted. However, the hundred titles for which data were gathered differed for each step because of the difficulties of tracking the same sample through the entire process.

Labor costs were calculated based on the salaries (including benefits) for the individuals performing the tasks according to the following formula: the number of productive hours per year per full-time equivalent divided by the salary equals the hourly rate. Production hours were figured assuming that a 35-hour work week equaled 1,540 hours per year, a 37½-hour work week equaled 1,650, and a 40-hour week equaled 1,760.

Until this study, most available preservation microfilming cost information focused only on the filming step, specifically the per-frame charges for producing a preservation master negative. There was very little information available on the costs for the selection and preparation stages or the cataloging of microforms. The twelve steps analyzed in this cost study were (1) identification of titles within the scope of the project; (2) retrieval of the materials; (3) preparation of circulation records; (4) searching for extant microforms; (5) curatorial review to select titles to be microfilmed; (6) recording intent to microfilm in RLIN; (7) physical preparation of the items for filming; (8) preparation of targets; (9) filming; (10) inspection of film; (11) cataloging of microform edition; and (12) storage of master negative. Labor costs alone were calculated, except for steps 9 and 12, which also included the costs for supplies.

RESULTS OF THE STUDY

An explanation of the steps in the process and the results of the study is offered here to provide a frame of reference for comparisons to other projects and cost studies. The steps have been grouped according to the following categories: identification and physical preparation of materials, filming and inspection, queuing and cataloging, and storage. The average cost at each institution to complete all twelve steps for a title ranged from $25.81 to $71.80, with $48.20 representing the median cost. (Variations will be explained in a later section.) These figures do not include overhead or administrative costs; they also do not account for charges incurred for online time on the RLIN system, either for searching or for cataloging, which would add $0.70 for an original record and $2.13 for one that was derived from a record already in the database.

IDENTIFICATION AND PHYSICAL PREPARATION

The seven steps involved in choosing, assembling, and preparing materials for the filming process consumed approximately 16% of the resources devoted to this project. Because the project was committed to making a sizable impact on preserving strong collections of American imprints and Americana—rather than just filming the most critically deteriorated materials as they crossed the circulation desk—a method was devised to systematically identify embrittled materials in the categories targeted by each institution. Although the order varied somewhat, at each of the institutions, clerical assistants searched the library's shelflist for materials within the criteria in given call number ranges, made photocopies of cards and prepared work sheets for potential candidates, pulled the materials from the stacks, and tested them for brittleness (using the double-fold test).[2] Once titles passed these initial steps, they were charged at the circulation office to the preservation unit. These procedures comprise steps 1 through 3 in the cost study, that is, title identification, retrieval, and preparation of circulation records. Because these steps could be performed by less expensive clerical or student staff in a short period of time, the median cost per title was less than $1 for all three steps.

The searching part of the project was more complex. While all participating institutions agreed to search the same basic tools (*The National Register of Microform Masters*, University Microfilm's *Books on Demand*, *Guide to Microforms in Print*, *The New York Public Library Register of Microform Masters*, and the RLIN system) some institutions elected to search additional sources because of their particular subject areas. In addition, the "hit rates"—that is, the incidence of finding a reprint or another film—varied dramatically depending on the subject area. Sixty percent of the American literature titles searched at Columbia had been filmed already, while less than 1% of Minnesota's dime novels and 8% of Brown's poetry collection had been filmed previously. The hit rate for American history materials was approximately 25% at both Yale and Berkeley. Michigan's average hit rate for its social science and technology materials was also 25%. The subject areas searched at the New York Public Library, including law, philosophy, religion, medicine, and cultural anthropology, ranged between 9% and 15%, with an average of 12%. The hit rate, as well as the number of sources checked, had a significant impact on the searching costs incurred.

In most institutions the curatorial review step occurred after the searching was completed. Curators or bibliographers reviewed the materials to determine whether they were appropriate to film or to retain in hard copy after filming. The criteria varied depending on the collections. For example, while it was deemed important to preserve all variant editions of American fiction, that was rarely necessary for social science or history books. The Harris poetry collection at Brown University, the Hess dime novel collection at the University of Minnesota, and the Bancroft history materials at the University of California–Berkeley required little curatorial time because the decision was made at the outset to film the entire collection (falling within the appropriate imprint dates) unless condition or format dictated otherwise. The median cost per title for curatorial review in all participating institutions amounted to $0.41.

The physical preparation part of the process, as well as the preparation of targets to be filmed with the items, included a number of important—and often time-consuming—operations. Although the condition of the materials and local policies contributed to variations in the routines from one institution to another, in general the libraries measured the following activities for the cost study:

- page by page collation and flagging of volumes with any special instructions
- minor repairs; ordering of missing or damaged pages when necessary
- computation of length of reel based on number of pages or volumes
- brittleness testing (unless it was done at the retrieval step 2)
- disbinding of volumes, removal of bindings (optional)
- preparation of bibliographic and eye-legible targets as needed; insertion in appropriate places in the volume
- insertion of standard targets or markers to indicate where the filmer should put them, e.g., "Start," "End of title", "End of reel"
- insertion of copy catalog cards for filming
- delivery of materials to filmer
- completion of paperwork to prepare materials for cataloging; sorting of forms and filing of cards after cataloging

At an institution where the materials did not require several of these steps (the books were in relatively good condition, they were not being disbound, and the filmer calculated the reel breaks), identification and physical preparation took approximately 7 minutes per title of a student employee's time. At an institution where the materials required extensive preparation, these steps took slightly more than 50 minutes per title of a paraprofessional's time. The median time for these procedures was 36.6 minutes, and the median cost amounted to $5.28.

FILMING AND INSPECTION

The project managers developed film specifications and guidelines for quality control based on the National Information Standards Organization (NISO) standards and Library of Congress practice to ensure the production of archival quality microfilm and compatible procedures.[3] In addition, they all used the same forms for project work sheets and quality control sheets to assist in the compilation of comparable management data. Five institutions performed their filming within the library, and two used commercial service bureaus. Most libraries contracted with commercial operations for at least one of the processing and duplication services as well as the chemical testing. The filming figures include the following procedures:

- camera work to film the title and appropriate targets
- processing and printing of three generations of film (including a master negative, a printing master, and a positive service copy)
- set up, clean up, record keeping, and technical inspection (density readings and averaging, microscope examinations for resolution, frame-by-frame inspection)
- completion of corrections and splicing, if necessary
- box labeling; reel wind up; routine equipment adjustments; returning books, targets, and film to preservation office.

The filming costs ranged from a low of $0.18 per frame to a high of $0.34 for the production of three generations of film. In most cases it was possible to film two pages per frame.

In addition to the technical inspection performed by the filming agent, the preservation unit conducted another inspection for both technical and bibliographic quality. If the initial inspections of 100% of the film revealed no problems, then inspections were performed on (at least) a 10% sample from each shipment. This inspection averaged one to seven minutes per title, with a median cost of $1.44.

QUEUING AND CATALOGING

To understand the costs related to cataloging, some background on the Research Libraries Information Network (RLIN) system and RLG policies is necessary. Because the RLG Preservation Program places a strong emphasis on the accessibility of preservation information online, with Andrew W. Mellon funds made available to the New York Public Library, the RLIN system was enhanced in 1981 to highlight information about microforms contained in the 007 field on the MARC record. A special feature called the queuing date (QD) field, enabling libraries to indicate their intention to film a particular title as soon as that decision is made, was also added to the system. These features make it very easy to search for either queued or filmed materials recorded on RLIN and also serve to conserve resources by minimizing unnecessary duplicate preservation filming.

Furthermore, in an attempt to reduce cataloging costs and increase the number of retrospective bibliographic records in the RLIN system, RLG adopted a cataloging standard for retrospective conversion of catalog records, which libraries may use rather than full AACR2 cataloging. Essentially, this *recon standard*, as it is called, allows cataloging to be based on existing catalog card records and does not require the cataloger to work from the book (or any other format) itself.

The figures in the cost study reflect the fact that at the time the decision to film was made, all participating institutions were required to enter a brief record in RLIN along with a date in the queuing date field to notify other libraries. The use of the recon standard for cataloging was optional; however, it was used by five of the seven participants. Cataloging and queuing times combined ranged as low as 23 minutes and as high as 66 minutes per title. The median cost for these activities was $5.60.

STORAGE

To ensure that the 30,000 master negatives produced as part of this project are stored under optimal conditions, they are kept in a private vault, which RLG leases from the National Underground Storage (NUS) in Boyers, Pennsylvania. Located in a renovated limestone mine, the vault has been specially equipped and is continually monitored to maintain the temperature at 60°F and the relative humidity at 35%. Prices for this type of storage vary depending on the number of reels to be stored, the exact specifications, and the company. In 1986 the annual rental fee per drawer in the common storage space at NUS (with a minimum of 20 drawers, each of which holds 40 to 42 reels) was approximately $30. The smallest vault (600 cubic feet) rents for $3,300 per year plus the one-time purchase price for drawers of approximately $25 apiece. The RLG vault is 863 cubic feet and rents for $4,746 per year. It has capacity for approximately 17,440 rolls of 35mm microfilm.

The cost study does not account for these storage costs since they are ongoing fees treated as overhead expenses. However, the costs for labels, mailing cartons, and shipping to the facility were calculated as were those for the related labor expenses. The median time spent on this activity was 1.75 minutes per title (with an average of 3 titles per reel), and the median cost per title for labor and supplies was $0.15.

VARIATIONS IN COSTS AMONG THE SEVEN PARTICIPANTS

The costs and times involved for each of these twelve steps at the participating institutions varied widely. Table 1 summarizes the ranges in time spent for each step and also gives the median time for that activity across all project participants; table 2 reports on the average high, low, and median costs. A number of factors contributed to the variations, including the nature of the materials themselves, labor costs in a given geographical area, and institutional practices for such activities as the level of cataloging, local requirements for card catalog representation, and whether filming was done in-house or by a commercial service bureau.

The category of materials to be filmed represented the most significant variable among the seven projects. Because filming costs accounted for between 45% and 78% of the total costs, the number of frames per title made a dramatic difference in the costs. Certain collections such as the Harris collection at Brown and the Hess collection at the University of Minnesota consisted of books with far fewer pages per title than, for example, the social science monographs at Michigan or the American

TABLE 1

AVERAGE TIME SPENT ON STEPS IN THE RLG COOPERATIVE PRESERVATION MICROFILMING PROJECT

	Time (in minutes)		
For 100 Titles	low	high	median
1. Title identification	.4	5.2	1.4
2. Retrieval	.5	4	1.8
3. Circulation records	.9	5.4	1.9
4. Searching	1	19.4	5.5
5. Curatorial review	.3	3.2	1.1
6. Queuing	4.3	16.5	14.4
7. Physical preparation	4.9	44.5	21.6
8. Target preparation	2.3	26.9	8.3
9. Filming	50	186.5	117.1
10. Film inspection	1.2	13.9	6.7
11. Cataloging	8.3	60	17.3
12. Labeling/packing	.3	7.7	1.8

TABLE 2

AVERAGE COSTS FOR STEPS IN THE RLG
COOPERATIVE PRESERVATION MICROFILMING PROJECT

	Costs (in dollars and cents)		
Institutional per Title Averages:	low	high	median
1. Title identification	.09	1.09	.29
2. Retrieval	.03	.76	.19
3. Circulation records	.07	.78	.32
4. Searching	.06	1.69	.65
5. Curatorial review	.07	1.12	.41
6. Queuing	.45	3.32	2.59
7. Physical preparation	.50	7.74	3.76
8. Target preparation	.23	3.85	1.52
9. Filming	16.75	47.14	31.91
Filming costs figured on a per frame basis:	.18	.34	.26
10. Film inspection	.19	2.94	1.44
11. Cataloging	1.96	19.70	3.01
12. Labeling/packing	.11	1.68	.15

history materials at Yale. The average number of frames per title at participating institutions ranged from 49.5 to 197.6.

Other variables inherent in the nature of the materials were their conditions (which influenced the amount of preparation and filming time required), their subject area (which affected the amount of searching time necessary to verify that films were not available), and the relative ease with which they could be identified, retrieved, and approved for filming. It is usually much less expensive to film a special collection of monographs already preselected and housed in one location than to work through a shelflist or other screening process, retrieve materials from all over a library (or campus), and subject them to item-by-item review by curatorial staff.

The available labor and the cost of that labor also contributed to the cost differential from one institution to another. For example, student labor at the University of Michigan was readily available and relatively inexpensive compared to unionized full-time employees at the New York Public Library. Throughout ten of the twelve steps in the preservation microfilming process, labor makes up virtually 100% of the costs calculated in this study. (The steps with a significant supplies component included filming and packing/shipping.) Consequently, the market rate salaries in a given area or institution for positions such as curators, project managers, catalogers, camera operators, and clerical assistants had a significant impact on the average costs, as did the speed with which each of them was able to complete required tasks.

Finally, institutional practices also contributed to the cost differential. At the two institutions which elected to do full AACR2 cataloging of the preservation microfilm, it took approximately one hour per title (using a combination of paraprofessional and professional time) and constituted almost 30% of the total dollars spent at those institutions on the project.

In contrast, at the other five locations all of which used paraprofessional or student staff to catalog at the RLG recon level, the percent of the total costs attributable to cataloging was in the 8% to 15% range and took a median time of 29 minutes per title. (These cataloging calculations include the queuing step of the process as well as the final cataloging of the completed film.)

As to the variation in costs between filming done within an institution and filming done by a commercial service bureau, this particular study does not demonstrate a wide cost differential. The two institutions which used commercial service bureaus (one for profit, one not-for-profit) paid $0.33 and $0.34 per frame, respectively, for all filming expenses to produce three generations of microfilm (a master negative, printing master, and service copy). The institutions with in-house facilities calculated per frame costs between $0.18 and $0.28 per frame. It is significant, however, that none of these figures are perfectly analogous to the others. There are discrepancies in the degree to which institutions factored overhead costs into these numbers and whether or not the individual photoservices unit reported a flat rate charged for all filming or was able to calculate exactly what was expended on the particular project. Other factors influencing the filming costs included volume (the number of titles processed at each institution for the project), the ability to streamline procedures, the condition of the materials, whether the bindings had been removed for filming (adding to the preparation time but speeding up the filming time), and the skill of the staff.

Although not a significant factor in the overall costs, the amount of time and money expended on the preparation of targets for filming with the items nevertheless represents one of the most dramatic illustrations of the way in which local practices can affect the costs. At least one institution prepared bibliographic targets using student labor to hand letter them. This procedure cost $0.23 per title. The majority of the institutions preferred printed targets (prepared by several different methods) and included more targets to assist the reader in using the film and to account for anything unusual about the film (such as missing or mutilated pages or illustrations filmed at the end). Consequently the costs among the seven institutions ranged from an average of $1 to almost $4 per title.

However, there is more at issue here than costs, and the implications extend beyond target preparation to all aspects of the process. The real question is, how does one strike a balance between the quality of the final product and the costs associated with adhering to high standards and facilitating the patron's use of the film? While this study could not produce clear-cut answers to this somewhat rhetorical question, it, at least, provided more information for managers to use in making decisions about specific local procedures.

BENEFITS OF THE STUDY

This project provided a unique opportunity to survey costs for producing archival quality microfilm at seven different institutions using mutually agreed-upon procedures and standards. By offering more information on the subject of costs, the study enabled the project managers to consider possibilities for reducing costs based on their individual experiences and that of their colleagues.

These insights led to a revision of the project guidelines (as reflected in the second edition of the *RLG Preservation Manual*) as well as to adjustments in some local procedures. Once it was established that any of the bibliographic sources consulted during the search process yielded a hit rate of 10% or less, checking was discontinued. Savings realized from less searching should more than offset the occasional duplicate film which results from the relaxed standard. The installation of RLIN terminals in several of the preservation units involved in the project made it more convenient, and therefore cheaper to search, queue, and catalog the materials.

To streamline the preparation step the requirement for page-by-page collation was eliminated for most volumes that appeared, after a quick inspection, to be intact. In addition, the practice of erasing stray marks on pages and mending tears was discontinued except when the legibility of the text was severely affected. And multiple targets indicating specific collation problems throughout a volume were replaced by one target at the beginning to indicate ''Best Copy Available'' or ''Filmed as Bound.'' In the future several institutions plan to produce targets using microcomputers, which should reduce the costs even further.

The results of the study do not constitute a basis for direct correlations in estimating costs for other projects. They can, however, provide a general framework for cost predictions. For example, in similar projects, one could assume that the filming costs (which can be easily calculated by using a filmer's per frame estimate in combination with a projection as to the total number of pages to be filmed) constitute between 45% and 78% of the total costs.

Estimates for the other steps in the process can usually be derived by analyzing the collections to be filmed. How much searching will be needed to determine whether an item has been filmed? To what extent will curatorial review be necessary? What level of cataloging is required? What are the staffing needs and requisite salaries? In most instances, it is worthwhile to conduct time studies of a small sample of the materials for steps with potentially significant variables, such as searching, preparation, and cataloging. Local labor costs can then be calculated according to the time figures. The appendix includes a formula along these lines that has proved useful in making estimates for other RLG preservation projects.

CONCLUSION

This study represents one systematic attempt to document the costs associated with all steps involved in the production of archival quality preservation microfilm. Aspects of this project, as well as local complexities at each participating institution, may not apply in other projects. More than anything else, the diversity of results and special circumstances that existed among the seven institutions participating in the same project argue against the existence of a typical project on which others can base their own estimates. Nevertheless, as other studies are undertaken and made available, they can, in combination with this one, begin to establish a reservoir of data so that more informed costs estimates will be possible.

REFERENCES AND NOTES

1. Research Libraries Group, *RLG Preservation Manual*. 2d ed. (Stanford, Calif.: Research Libraries Group, 1986). References in this article are to the second edition, although the first edition was used in the project.
2. For an explanation of the test for embrittlement see Gay Walker and others, "The Yale Survey: A Large-Scale Study of Book Deterioration in the Yale University Library," *College & Research Libraries* 46:119 (Mar. 1985).
3. See Library of Congress, Preservation Microfilming Office, *Processing Manual* rev. 1981 by Tamara Swora and Bohdan Yasinsky. (Washington, D.C.: Library of Congress, 1981). The ANSI (later NISO) standards consulted in the preparation of the guidelines and specifications are cited in *RLG Preservation Manual* (see ref. 1), p.21.

APPENDIX A
WORK SHEET FOR ESTIMATING PROJECT COSTS

It often is necessary to prepare a projected budget, either for a grant proposal or for internal budget planning, before embarking on a preservation microfilming project. This work sheet provides a framework that can be adapted depending upon the particular circumstances. It is meant to be suggestive rather than prescriptive. Many of the steps apply only to typical book format library materials and will not apply to archival or manuscript materials.

A. Define and figure the size of the entire target population *before* the searching and curatorial review steps occur (this step will probably require a sample study).
1—Total number of volumes in the proposed collection = _____ (1)
2—Total number of titles in the proposed collection = _____ (2)

B. Estimate the percentage of materials expected to be eliminated by curatorial review (this step may require a sample study).
3—Estimated percentage expected to be eliminated by review process = _____ (3)

C. Anticipate the searching hit rate, that is, the percentage of titles expected to be available on film, fiche, or other format. It probably will be necessary to conduct a pilot search project to document this percentage. In the RLG project alone the hit rate ranged as low as 1% and as high as 60%, depending on the target and search strategy.
4—Estimated searching hit rate percentage = _____ (4)
(Depending on the project, it may be advisable to switch the order of steps 3 and 4. Some curators will prefer to review materials after they have been searched while others will be able to screen materials before the searching step.)

D. Reduce the numbers in steps 1 and 2 first by the percentage in 3, then by the percentage in 4.
5—Number of volumes to be filmed = _____ (5)
6—Number of titles to be filmed = _____ (6)
6a—Calculate average number of volumes per title = _____ (6a)
<Divide number of volumes by number of titles.>

E. Estimate the local costs per title for prefilming activities (identification, searching, preparation, and curatorial review). Estimate times for each step and then costs, based on the level of staff performing each step.
7—Estimated prefilming costs per title = _____ (7)
7a—Prefilming cost per title converted to per volume = _____ (7a)*

F. Estimate the amount of time it will take to catalog each title. Consider whether the item already has been cataloged, whether the record is already online (where applicable), whether the original needs to be withdrawn from the collection, the standard of cataloging to be applied, level of staff to be assigned to the task, etc. <The average time for this step ranged from 23 to 66 minutes in the RLG project, which also included queuing the title on the RLIN system at the time the decision was made, and then later updating that record.>
8—Cataloging cost per title = _____ (8)
8a—Cataloging cost per volume = _____ (8a)*

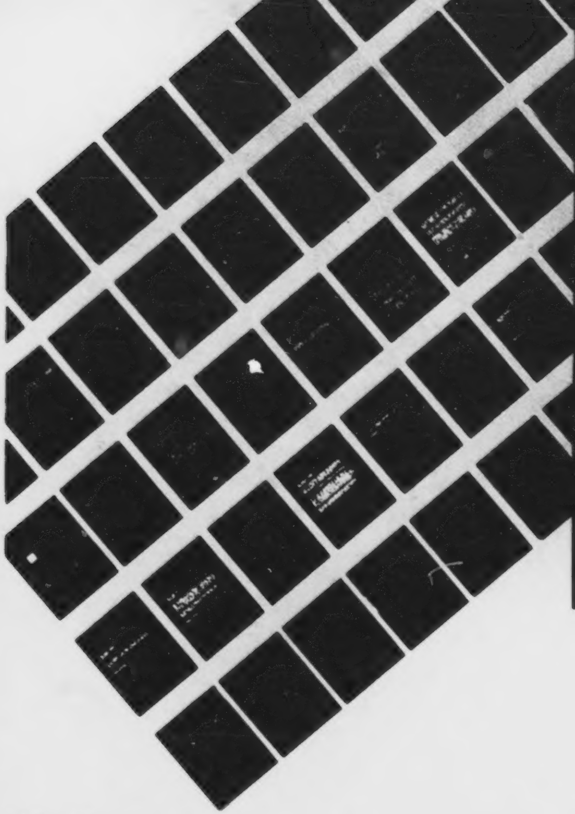
G. Calculate the average number of pages per volume among those in the to-be-filmed category (a sample study is usually necessary)
9—Average number pages per volume = _____ (9)

H. Get an estimate from the filmer, whether internal or external, for the per frame cost of producing master negative and service copy (and duplicate negative, if applicable). This should include all charges from filmer, e.g., inspection, supplies, labor, etc.
10—Per frame filming charge = _____ (10)

I. Unless filming newspapers or other oversized materials, allow two pages per frame. When calculating per volume costs for filming and producing all required generations:
11—<9> ÷ 2 × <10> = per volume filming costs = _____ (11)*

J. Calculate local inspection costs (filmer's inspection costs should be included under H). <Based on RLG project, local inspection may take between 5 and 15 minutes per title depending on number of frames.>
12—Local inspection costs per volume = _____ (12)*

Add * items to arrive at an approximate cost per volume.



Photoduplication Services

The Northeast Document Conservation Center

Why Copy

NEDCC's photoduplication department complements the services of its conservation laboratory, offering a cost-effective alternative to preserving information when restoration of the original is not practical. With so much documentary material in an advanced state of deterioration, copying can play a role in the preservation of most collections. Many old newspapers and nitrate negatives, for instance, are so voluminous and deteriorated that only the information they contain can be preserved.

Copying has other advantages. It helps preserve rare books and manuscripts by virtually eliminating the need to handle fragile originals and allowing added security through off-site storage. The relatively low cost of copying, especially using microforms, provides researchers with greater access to unique information.

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- ***Duplicate Negatives***
- ***Copy Negatives***
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Microforms
NEDCC offers a highly competent preservation microfilming service for library and archival materials. This service is supported by the other unique resources of the Center. NEDCC's paper conservation laboratory and bookbindery are equipped to handle virtually any problem involved in the physical preparation of books or paper for filming, such as loosening bindings, flattening creases or repairing torn documents. Editorial preparation is supervised by a trained librarian or archivist who is familiar with the organization and arrangement of newspapers, tax records, scrapbooks, correspondence and old photographs on microforms—to name only a few examples. The equipment and techniques used in filming are designed to achieve optimum legibility of materials which are frequently irregular in size, and exhibit poor contrast between background and text. Frame-by-frame editorial inspection of all microfilm is available as an extra service. For institutions with their own in-house programs, the Center offers microfilm processing, duplication and camera operator training.

Photographic Copying
NEDCC has extensive experience in the duplication of historical photographs and can assist the archivist, librarian or curator in evaluating the relative cost, quality and retrieval advantages of various copy methods. When same-size copies are required, the Center utilizes a two-step, interpositive process which produces the most faithful reproduction of image detail. Other services available through the Center include microfilm, fiche, slides, contact prints and enlargements. For especially large collections, a comprehensive record copy on microform, supplemented by full-size prints or enlargements for purposes of sale or publication, is often desirable. Sample copies and informal consultation with our staff are usually helpful at the early stages of most projects.

Consulting and Preparation Services
The department makes available expertise in the preservation of library and archival materials on microforms which can assist repositories contemplating preservation projects. Services commonly provided on a consulting basis include conducting needs assessment surveys, determining the feasibility of in-house programs, developing project specifications and guiding the preparation of materials for filming. The Center also has the capability for processing and editing of collections in preparation for filming when this cannot be done by a client in-house.

Storage
Long-term storage under controlled environmental conditions is offered by NEDCC for all microform masters at a nominal fee. This helps to ensure the archival quality of the film and provides extra protection against loss by fire, theft or natural disaster. Long-term storage through the Center can be especially useful to institutions whose holdings are not large enough to justify the cost of building or renting suitable facilities.

Educational Programs
The Center frequently sponsors workshops and seminars on photoduplication as a method of conservation. Archival permanence of microfilm, conservation vs. copying, the duplication of nitrate negatives and the preparation of manuscript materials for filming are among the topics covered in recent programs. The Center can provide speakers or arrange programs for institutions that wish to sponsor workshops or seminars.

About NEDCC
The Northeast Document Conservation Center is a non-profit, regional conservation facility, specializing in conservation of library and archival material and art on paper. Its purpose is to provide the highest quality paper conservation services to institutions that do not have in-house conservation facilities or have only limited ones. It has a highly trained staff of professional conservators, who perform treatment on a great range of materials: books, manuscripts, maps, printed records, photographs, and art on paper. In its nine year history, the Center has performed work for more than 800 museums, historical organizations, libraries and archives. It has served thousands more through its educational programs and consulting services.

Hours: The Center is open Monday to Friday, 8:30 - 4:30

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Establishing a Preservation Microfilming Program: The Library of Congress Experience

by Lawrence S. Robinson

The Library of Congress's Preservation Microfilming Office (PMO) does not regard its principal function – the transference of printed information from fragile hardcopy to archival microform – as an interim measure; unless the filmed material is deemed of high artistic or artifactual value, it is subsequently pulped. The selection and review of material prior to microfilming is therefore crucial. Here – in a paper originally presented at the Third Annual Preservation and Conservation of Library Materials Conference (Philadelphia, PA) in 1983 – the author, a PMO officer, examines in detail LC's approach to these labor-intensive procedures, the foundations on which all preservation microfilming programs are established.

I welcome the opportunity to address an audience of library professionals concerning a little-discussed aspect of preservation work – that of the selection and review of material prior to microfilming. In preservation microfilming one readily thinks of the transfer of information from hardcopy to microform, and the format that has been commonly used is microfilm. When this transference (following all existing standards and specifications for the preparation and filming of material) is completed, it is termed *preservation microfilming*. During the very process of "preservation," however, the fragile paper being filmed may crumble; most librarians have seen the confetti that results when it is touched.

In making the difficult decisions about *which* deteriorated materials can be filmed and then discarded without significant historical loss, those experienced in preservation microfilming have long been consulting with others. Soon many of the problems faced over the years may be solved by the use of new transfer media such as the optical disk. These new technologies will enable librarians to preserve and access the intellectual content of the original better, but certain critical problems of selection and preparation will remain.

The amount of material on master negatives in both private and public hands is enormous. At the Library of Congress alone, 270,000 reels (with an estimated collective value of $27 million) are housed. LC is continuing to add material to this collection from a variety of in-house microfilming programs. It and other institutions have been microfilming newspapers for years; private microform publishers have produced comprehensive microfilm collections containing a staggering number of titles; and local, often unique, collections have been filmed, benefiting researchers everywhere.

Beginning in the 1930s with the treatment of newspapers, the transfer medium of necessity, if not of choice, has been microfilm. More specifically, it has been 35mm microfilm, and for preservation purposes, 35mm silver halide, archival-quality microfilm. The option of preserving embrittled material on microfilm has made it easier for custodians of international, national, and local repositories to make the critical decisions about preserving the information while sacrificing the physical piece.

The details of establishing a preservation microfilming program have been most effectively discussed by Pamela Darling (Preservation Department, Columbia University) in several of her articles. The literature on the technical procedures and standards to be followed is formidable, and it reliably answers most questions about standards and specifications. Therefore, it seems most useful to concentrate on those elements of the process least discussed – that is, those of the selection and review of material prior to microfilming. The experience LC has gained in this little-discussed area may prove useful to others. Ultimately, selection and review may be the most critical aspects of the process, since such decisions will have to be made irrespective of what transfer technology is used. Currently, the major cost of preparing material for filming at LC is that of the intellectual or bibliographical process of assessing the relative value of the item prior to microfilming. Although the costs of processing and storage may

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Lawrence S. Robinson, assistant director for preservation in LC's Preservation Office, has fulfilled a variety of responsibilities at the Library of Congress and has contributed widely to the library profession. A founding officer of the Preservation Microfilming Office (PMO), he has been active in the professional aspects of library micrographics through his work in the American Library Association and the Association for Information and Image Management (AIIM – formerly the National Micrographics Association).

decrease with the use of electronic media, those of selection and review (labor-intensive processes) will more than likely remain the same. The problems of selection and preparation are also more likely to be similar across those institutions and libraries with research and archival sources in need of preservation.

Background of the Preservation Microfilming Office (PMO)

The Library of Congress preservation microfilming program is one of the largest public microfilming programs of its kind. To discuss it in detail, it is necessary to provide some background information about its development and mission. For the past fifteen years, the Preservation Microfilming Office (PMO) has prepared for filming a total of 93 million pages of 300,000 volumes. It was preceded by the LC Pilot Preservation Project, which was initiated in 1967 with a grant provided by the Council on Library Resources to the Association of Research Libraries and, in turn, the Library of Congress. The pilot project compared the book condition of a selected group of deteriorated titles from the LC collection to copies in various institutions. It was discovered that condition varied greatly among institutions holding copies. The study itself was prompted by a recommendation submitted by Gordon Williams (former director of the Center for Research Libraries) to the Association of Research Libraries' Preservation Committee. Williams proposed that a national storage collection be established for preservation.

This idea proved to be unworkable, but LC continued its efforts to deal with its own deteriorated material. Prior to 1967, the Stack and Reader Division (currently the Collection Management Division) had simply accumulated deteriorated material, storing it rather than applying systematic treatment. The functions of the pilot project and what was termed the "Brittle Book Project" were transferred to the newly created Preservation Office in 1968. The office is now fully integrated into the total LC preservation effort, which is currently in the able hands of Dr. Peter Sparks.

Mission of the Preservation Microfilming Program

The Library of Congress Preservation Microfilming Office is responsible for the conduct and management of the Library's program to preserve by microfilming and, when necessary, to dispose of deteriorating, damaged, or mutilated materials. It is also responsible for maintaining liaison with other LC units as well as with nonprofit institutions engaged in preservation microfilming outside the Library of Congress.

Using routines described in the *Preservation Microfilming Office Processing Manual*, the PMO prepares state-of-the-art archival microfilm. The manual is Library of Congress-specific, but many other institutions with different missions and smaller budgets have found it useful as well.

To help it keep pace with – or at least make a dent in – the huge processing load, the PMO has been provided over the years with increasing support for microfilming. Techniques have been refined for greater efficiency. The selection and review process has also evolved significantly, and the broad procedures followed to make these decisions may be of interest to *MR*'s readers.

At the outset, it is important to stress that Library of Congress material does present a unique case in that LC has a mixed mission. It is both a library serving Congress and the public *and* a national library of record, responsible for the preservation of material representing U.S. and other cultural histories.

The Preservation Microfilming Office is responsible for the preservation of material from the Library's general collections, which comprise about 20 million books and pamphlets. (The total number of items in the Library of Congress is approximately 80 million.) This figure includes material in the custodial divisions, such as Law, Rare Book and Special Collections, Music, and Area Studies. The custodial divisions at times prepare their own material for filming, or they may request that the Preservation Microfilming Office do so. As a rule, therefore, the PMO does not handle a wide variety of formats such as newspapers, manuscripts, and nonbook material; it primarily films cataloged serials and monographs.

The material the PMO processes is embrittled to the extent that it is no longer serviceable and must be transferred from hardcopy to microfilm for continued use; only its intellectual content can be preserved.

The PMO does not consider preservation microfilming to be an interim measure for deteriorated material, and it therefore takes great care in the review process. LC does not film and then hold the physical volumes unless they have artistic or artifactual value. The delaying tactics of phased preservation are no longer possible for most material, and decisions about the disposition of original copy must be made.

Selection of Brittle Material

The PMO receives material from a variety of sources in the Library. The majority of titles needing treatment are routed through the Library of Congress Binding Office, which is part of the Preservation Office. Binding Office staff segregate those volumes whose paper can no longer withstand rebinding and transfer them to the Preservation Microfilming Office. These volumes are most often those that have been used by readers and in the process have been identified as brittle. Books received also include newly acquired material, recently cataloged titles from arrearages, and titles from special collections.

Role of Custodial Divisions at LC

As part of the general coordinating function of the Library of Congress, the Preservation Microfilming Office acts as a consultant to the ongoing preservation microfilming activities of LC's custodial divisions. For example, the Law Library, the Music Division, and the Copyright Office have their own preservation microfilming programs, the LC Photoduplication Service acting as their service bureau. PMO staff are available to advise them and may also prepare material for filming at their direction. For example, PMO has processed a collection of 3,500 Portuguese pamphlets for the Hispanic Division and 900 serial titles – the *Russian Imperial Government Publication Collection* – for the European Division. Both these collections were uncataloged, and the resulting microfilm provides access to this material outside the Library of Congress.

Stack Survey and Inventory

To facilitate treatment of low-use titles, preservation staff have periodically surveyed the Library of Congress stacks, tagging material to be processed; but this procedure is now unnecessary since a full-scale inventory of the Library of Congress general collection is underway. In 1980 Congress appropriated funds for the first complete inventory of the general collection. It is being done very systematically, volume by volume. Missing titles and volumes are being recorded, and books in need of repair or those that are brittle are being identified. The latter are slipped for preservation and will remain in the stacks for later treatment. The inventory will prove invaluable to the PMO's planning efforts, since, on completion, it will be known at a glance which titles are to be treated and how many are in a given classification. Brittle material was identified by nonprofessional staff with some preliminary orientation in PMO guidelines, but, in all honesty, little expertise is needed, since the material is so obviously brittle. It is estimated that four to six million volumes in the Library of Congress general collection are in need of some type of preservation treatment. The Library of Congress Selection Office, which is part of the Collections Development Office, is working closely with the inventory staff, providing guidance on weeding, deselection, and specific LC collection policies.

Cooperative Activities

LC has long been involved in cooperative programs, particularly those filming newspapers and foreign gazettes. The Preservation Microfilming Office and the Law Division are responsible for Library of Congress participation in the Foreign Gazette Microfilming Project. The PMO also maintains close contact with preservation microfilming officers at other libraries, such as: the New York Public Library; Yale, Harvard, and Columbia Universities; the Institute for Jewish Research; and the University of Illinois. The PMO will often film material cooperatively with these institutions, sharing the cost. Also, outside requests for microfilming of Library of Congress titles that may be deteriorated are received in the LC Photoduplication Service, which routes them to the PMO for consideration. Thereby a title is never partly reproduced for orders before it is thoroughly reviewed, and all the PMO routines for the preparation of an archival copy are followed.

The Review Process

The material received in the PMO consists primarily of imprints dating from 1860 to 1930. Little before or after this period is received and, in fact, most imprints fall between 1890 and 1910. This certainly is not reflective of the use of the collection but rather of deteriorated titles only. A small-scale use survey was conducted by Library of Congress interns a few years ago, and it showed that recent imprints were used more heavily than older ones, except in genealogy – the classification most heavily used at LC – where the converse is the case. PMO has therefore filmed many genealogy titles. The more recent imprints (those after 1930) PMO has filmed have been foreign titles, since U.S. paper from that period is generally of a higher grade.

Once the materials are incorporated into the PMO processing system, the physical condition of the volumes for a given title is reviewed. Basic bibliographic information is gathered, since deteriorated volumes are often linked bibliographically to other volumes that may or may not be brittle. A review of the artistic or artifactual value of the title can then be made.

The review process is now a Librarywide collaborative effort in which the PMO seeks advice, review, and filming clearance from subject specialists, format specialists (for illustrations and maps), and the Collections Development Office, which determines if the filming conforms to current Library of Congress policies. Nonbrittle material is also filmed occasionally so that lengthy bibliographic preparation is not duplicated, and volumes may be filmed in lieu of binding.

Rare Book Review

LC has been sending an increasing amount of material to the Rare Book and Special Collections Division for review. Rare book librarians often are greatly concerned about the damage done to books by any type of copying, and this concern is shared by the Library of Congress Rare Book staff. When the Rare Book and Special Collections Division chooses a title, the title is not filmed but transferred to the Division's custody. It is therefore critical that Division staff see selected volumes first. All unique material, and all titles that fall within the rare book guidelines, are sent to the Division before they are reviewed by any other division or specialist. Other institutions may not face this problem because all their material deemed to be rare may already be in protective custody. LC, on the other hand, owns a significant number of rare items still in the general collection, and these titles may be routed to the Preservation Microfilming Office. Often, when PMO requests the loan of volumes to supplement material or acquire copies of missing pages, the response from other institutions is that the item is in a rare book collection and cannot be lent.

The Library of Congress Rare Book Collection has begun gathering from the general collection titles with pre-1801 imprints. PMO transfers all such material immediately to this Division. For American imprints, PMO follows guidelines that vary according to state. If Rare Book does not want to add the referred titles, the titles are often further reviewed by other subject specialists, such as the staff of Children's Literature, the European Division, and others. If they contain illustrations, they are reviewed by the staff of Prints and Photographs, and if they contain maps, by the staff of Geography and Maps. A title may be reviewed as many as three or four times prior to filming. Records of all reviews and decisions are retained in the PMO.

Illustrated Material

All illustrated material (plates, portraits, etc.) is reviewed prior to processing by the staff of Prints and Photographs. They decide whether to *film and save* the entire volumes, *film* the volumes *and preserve* the illustrations, or *film and discard* the entire volumes. After the illustrations to be preserved are filmed by PMO, they are extracted from the volume, placed in an acid-free envelope, and stored (in most cases) near the service positive. Occasionally Prints and Photographs will assume custody of valuable photographs and engravings found in deteriorated books. Sometimes titles will be filmed at the request of subject specialists, and the volumes later restored. This extraction of illustrated material is not as time-consuming a process as it may seem, and it may be useful for all filming programs that discard the material after filming to give careful consideration to it. Because filming is done in black and white, PMO routinely weeds out colored material.

Maps

PMO has long preserved all folded and colored maps for custody in the Geography and Map Division. That Division's staff reviews all titles containing colored or large folded maps and all maps with an imprint before 1850 (printing techniques for maps of that era are of unusual interest). Also, tables of contents are removed both from titles containing maps and titles containing illustrations so that the user can more easily locate needed material.

Serials

Both the Serial Division and General Reference and Bibliography clear all serial titles for filming. The decisions are noted on a form routed through the Library.

Summary

For review of material PMO relies heavily on a network of about two hundred recommending officers and subject specialists in the Library of Congress. LC selection officers, though aware of the general importance of a title to a given field, tend to apply broad policies or make "micro decisions" based on the judgments of the format or subject specialists who evaluate each title's importance to their areas of scholarship. Subject specialists tend to have a hard time deciding to discard books, and they tend to be very conservative; they are, however, the best possible final arbiters, particularly at the Library of Congress, where the title in hand may be the only copy. PMO occasionally finds it is necessary to change a decision in light of bibliographic problems uncovered later, but it endeavors to follow the original decisions as closely as possible. PMO has found that, to evaluate artifactual or aesthetic value, the reviewer *does* need to have the physical volume in hand.

By means of the frequent consultations and close liaison work herein described, PMO ensures that valuable material in the Library of Congress collections is not destroyed.

Physical condition or bibliographic problems may influence the decision on the disposition of a title, but the specialist considers only the book itself. This consideration tempers the need to process material as efficiently and quickly as possible because of the vast amount of work to be done. At the Library of Congress, the interest and dedication exhibited by the subject specialists have often prevented our staff from becoming jaded and too production oriented.

Other Factors

There are several other factors PMO takes into account when making the final decision whether or not to microfilm a title. They include: the existence of reprinted copies or other editions; whether or not material is missing from volumes to be processed; and copyright.

Material will not be filmed by the PMO if it is found that the Library holds a reprint. PMO will still have the illustrations from the original reviewed, however, and LC may preserve them. When editions earlier or later than the edition under consideration are in the Library of Congress, PMO compares them, checking for textual variance, prefatory material, illustration, and so on. If the editions of a given work include additional or new material, PMO will film several of them, *always* filming the first edition. These decisions may also be qualified by the physical condition of the works.

A corollary consideration is the availability of commercial microfilm or microfilm produced by another nonprofit organization. If 35mm silver halide microfilm is available for a serial title, prior to ordering film PMO considers the completeness of the title, the quality of the microfilm, and the general reputation of the microform publisher. All microforms purchased by the Library must be cleared for technical quality by the Library of Congress Photoduplication Service. PMO has taken into account that the increase in microform publishing over the past twenty years was spurred primarily by expanding research needs rather than by considerations of preservation. To commercial microform publishers, the potential market value of a title or collection is the overriding criterion for filming. The large microfilming projects have somewhat served preservation needs, particularly in the area of nineteenth-century Americana, but even if an institution holds many of microfilm collections, as LC does, the problem of what to do with the book, the illustrations, the binding, the thing itself, remains. These are questions each institution—given its collections, needs, and resources—will have to answer.

It is important to remember that most commercial films originate in research library collections, including the Library of Congress's. The lending library in some cases may have received a small discount on the distribution film at the time of microform publication, but the master negative was held by the publisher, and in later years the institution might have been required to buy reproductions of material it once held.

Gaps and Wanting Material

The Preservation Microfilming Office prepares both monographs and serials for filming in as complete a form as possible. Copies of pages missing from monographs are ordered from other institutions and are filmed. Only if the title is unique to the Library, or if, owing to the brittle condition of the volumes, the institutions holding the title will not provide copies or will not lend since they deem the title a rarity, will the PMO microfilm an incomplete monograph. When borrowed material is filmed, the PMO includes a target on the film that credits the institution that supplied the supplementary material.

Individual issues missing from serials are not ordered, but larger portions or volumes are, so that as complete a set as possible is gathered. This policy often evolves into cooperative filming of a title, another institution sharing in the cost of the production of the master negative. LC often cooperates with the New York Public Library in this way.

Copyright

Prior to the 1976 revision of the copyright law, if there was a possibility a title was under copyright, PMO did not film it without first searching through the Copyright Office files for a claimant. If a claimant was found, PMO requested permission to reproduce the work for preservation purposes. As a result, PMO has accumulated a file of very interesting letters, the majority granting permission to film. This labor-intensive activity was an incentive to film noncopyrighted works, particularly foreign publications.

With the revised copyright law, Section 108, PMO is permitted by statute to reproduce a work for the replacement of a deteriorated copy. As stipulated in the law for all imprints after 1906, however, a copyright restriction on the microfilm is included, and if a copy is requested through the Library of Congress Photoduplication Service, the requestor is charged for a copyright search in addition to the cost of a positive copy. This charge has enabled PMO to expedite processing of all types of material.

Summary and Conclusions

Currently, readers, LC staff, and users via interlibrary loan are in essence determining what arrives in the Preservation Microfilming Office, and additional material is considered for treatment on request. The PMO is concentrating on high-demand items selected through use and is concurrently maintaining its commitment to the national preservation effort. Given the vast amount of deteriorated material with which it is faced, PMO is at a minimum preserving titles needed for research purposes, while working toward improving the condition of material in the LC collections.

This presentation has now come almost full circle through the entire preservation microfilming process. A few final details. After preparation and following the procedures described in the PMO manual, the volumes are cut, filmed by the Photoduplication Service, and the negative and positive copies are edited. All volumes, except those unique titles to be retained after filming, are sent to the Exchange and Gift Division. If the material is not claimed by interested institutions, it is pulped. The master negative remains in the custody of the Photoduplication Service and is housed according to specifications. PMO immediately reports the transfer to the *National Register of Microform Masters* in the Catalog Management and Publication Division.

To conclude, the Library of Congress Preservation Microfilming Office has long been responsible for initiating changes in all relevant cataloging and control records, reflecting the transfer from hardcopy to microfilm. This has been done manually and has been very time consuming, but now the Office is inputting minimal AACR2 data into what is termed the "LC Automated Process Information File." The records will ultimately migrate into the LC MARC file and be available to the bibliographic networks via the MARC Distribution Service. It is also anticipated that a great deal of PMO's bibliographic work can be streamlined through the REMARC database, which in the Library of Congress is available through the Automated Shelflist File. In the next few years there will be great changes in the work of the PMO, all made possible by the use of machine records and storage. The Preservation Microfilming Office is heavily involved in the Optical Disk Project, and further revision of procedures will undoubtedly take place. The vital procedures for selection and review however, will and should remain the same.

The Ohio State University
Libraries
Preservation Office

SEARCH FORM FOR PRESERVATION REPLACEMENT: MONOGRAPH

Order Record:

Possible suitable replacements available/source:

Notes:

LCS holdings statement:

(See attached printout from automated catalog.)

Replacement search results:

Hard copy: A T
BIP ______
BIP Suppl. ______
Forthcoming ______
GTR ______
BBIP ______
other:

Notes:

0 = not listed
X = listed/available
- = not searched

Microform: A T
NRMM (65-75) ______
(1976) ______
(1977) ______
(1978) ______
(1979) ______
(1980) ______
(1981) ______
(1982) ______
(1983) ______
BOD ______
NUC fiche ______
NYPL fiche ______
GMIP ______
GMIP Suppl. ______
MA ______
other: ______
Notes:

Bibl. Util.: A T
RLIN fiche ______
RLIN on-line ______
OCLC ______
other: ______
(specify)

Rarity/Sarcity:
NUC pre-56 search:
more than 6 holding libraries?:
NUC: ______
if 5 or fewer, list locations
NUC: ______

("Curatorial Review and Decision" ... see over)

CURATORIAL REVIEW AND DECISION:

Selector's instructions to Preservation Office staff: (mark appropriate area)

1. Order microform available: _______ for this edition only; _______ for any edition.

Fund : ____________________

2. Order reprint available: _______ for this edition only; _______ for any edition.

Fund : ____________________

3. Create microfilm (for those not available as commercial replacement): _______.

4. Create photocopy facsimile (for those not available as commercial replacement): _______.

Fund : ____________________

5. Disposition of original (for items being replaced): _______ withdraw from collection

_______ provide enclosure, reshelve

_______ Other:

6. Do not replace, instead: _______ provide enclosure, reshelve

_______ withdraw from collection

7. Other:

Selector ____________________________ Date: __________

PRESERVATION OFFICE DISPOSITION: cite date completed: indicate with a "✓" when included in statistics; initial.

1. Replacement search completed __________________________

2. Replacement microform order sent to ACQ: ____________________

3. Replacement hard copy (reprint) order sent to ACQ: _______________

4. Page-by-page collation for "create film" and "create photocopy" items:

_______ complete; _______ pp. missing: _______ ILL pages ordered, _______ ILL pages received

5. Sent to be filmed _______________; Rec'd _______________; Inspected _______________.

6. Sent for photocopy facsimile _______________; Rec'd _______________; Inspected _______________

7. Sent to cataloging _______________.

8. Disposition of original: repaired, sent to stacks __________; enclosure, sent to stacks _____

sent for withdrawal __________; transferred to __________;

IF IN DOUBT ... OBTAIN SELECTOR'S APPROVAL FOR ANY TREATMENT OR DISPOSITION.

The Ohio State University
Libraries
Preservation Office

SEARCH FORM FOR PRESERVATION REPLACEMENT: SERIAL

Order Record:

Possible suitable replacements available/source:

Notes:

LCS holdings statement:

(See attached printout from automated catalog.)

Replacement search results:

Hard copy:
BIS ____________
GTR ____________

Notes:

0 = not listed
X = listed/available
- = not searched

Microform:
SIM ____________
NRMM (65-75) ____________
(1976) ____________
(1977) ____________
(1978) ____________
(1979) ____________
(1980) ____________
(1981) ____________
(1982) ____________
(1983) ____________
GMIP ____________
GMIP Suppl. ____________
NST ____________
MA ____________
other: ____________
Notes:

Bibl. Util.:
RLIN fiche ____________
RLIN on-line ____________
OCLC ____________
other: ____________

Rarity/Sarcity:
NUC pre-56 search/ ULS/CRL search: more than 6 holding libraries?:

NUC: ULS:
if 5 or fewer, list locations

NUC:
ULS:

CRL holdings:

("Curatorial Review and Decision" ... see over)

CURATORIAL REVIEW AND DECISION:

Selector's instructions to Preservation Office staff: (mark appropriate area)

1. Order microform available: ______ for this edition only; ______ for any edition.

   Fund : ________________

2. Order reprint available: ______ for this edition only; ______ for any edition.

   Fund : ________________

3. Create microfilm (for those not available as commercial replacement): ______.

4. Create photocopy facsimile (for those not available as commercial replacement): ______.

   Fund : ________________

5. Disposition of original (for items being replaced): ______ withdraw from collection

   ______ provide enclosure, reshelve

   ______ Other:

6. Do not replace, instead: ______ provide enclosure, reshelve

   ______ withdraw from collection

7. Other:

Selector ______________________ Date: ________

PRESERVATION OFFICE DISPOSITION: cite date completed: indicate with a "✓" when included in statistics; initial.

1. Replacement search completed ____________________

2. Replacement microform order sent to ACQ: ________________

3. Replacement hard copy (reprint) order sent to ACQ: ____________

4. Page-by-page collation for "create film" and "create photocopy" items:

   ______ complete; ______ pp. missing: ______ ILL pages ordered, ______ ILL pages received

5. Sent to be filmed ____________; Rec'd ____________; Inspected ____________.

6. Sent for photocopy facsimile ____________; Rec'd ____________; Inspected ____________

7. Sent to cataloging ____________.

8. Disposition of original: repaired, sent to stacks ________; enclosure, sent to stacks _____

   sent for withdrawal ________; transferred to ________;

IF IN DOUBT ... OBTAIN SELECTOR'S APPROVAL FOR ANY TREATMENT OR DISPOSITION.

Section 8: Cooperative Preservation Activities

BOOKS IN PERIL

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Cooperative Approaches To Conservation

PAUL N. BANKS

WHILE it has been stated and restated that library conservation problems are massive, it might be worthwhile once again to look at the dimensions of the problems in order to establish a context for discussing cooperative approaches to conservation. In quantitative terms, the 111 libraries which are members of the Association of Research Libraries and of the Independent Research Libraries Association hold something over 220,000,000 volumes. If this figure were not awesome enough, we might see what it does *not* include. It doesn't include the maps, manuscripts, photographs, and other nonbook materials of the member libraries. While it does appear to include most of the major research collections, there are over 24,000 libraries listed in the *American Library Directory*, many more than 111 of which clearly have materials which would be defined as research collections. And it does not include archive repositories or (with a couple of exceptions) historical societies, whose collections certainly include materials of permanent research value.

Qualitative as well as quantitative aspects of the conservation of library materials must be considered also. Indeed, one of the extraordinary difficulties in this field is that we must deal with a complex spectrum of materials, a spectrum which includes complete ranges of both intellectual and artifactual values. Approaches to the preservation of materials at the two ends of the spectrum are beginning to emerge, but there is as yet no philosophical basis nor are there satisfactory preservation methods for the vast range of materials in the middle of the continuum.

A third aspect of library conservation is temporal. The laboratory work of Barrow, Smith and others, along with purely empirical observation of the condition of books in older and more heavily-used research libraries, suggests that time is running out for a significant portion of these collections. Although the decline in the lasting qualities of paper has been remarkably linear since the 15th Century, the worst of the bad-paper period started in the 1870's and the rate at which books are actually becoming unusable appears to be accelerating. Nor should this be surprising when one considers not only the inherent instability of the paper, but poor environmental conditions, heavy use, weak original bindings, and destructive rebinding and restoration practices, and so on.

A fourth problem in library conservation is that it is expensive. Even microfilming, correctly thought of as the cheapest method presently available for preserving the intellectual content of brittle books, is hardly inexpensive when we are talking about millions if not billions of pages which need to be filmed. (The qualifier "presently available" should be noted here, since there is some hope that mass preservation methods—including optimum storage conditions—may become available to slow down significantly the rapid deterioration of materials.)

Less discussed in the literature of preservation, but equally daunting, is the cost of treating distinctive materials—those items which, because of technical or artifactual characteristics, must be physically preserved rather than being preserved through reproduction. Distinctive materials require careful individual decision-making and often many hours of scarce and expensive skills to restore. Moreover, it is questionable whether major cost savings through improved technology will be possible in this area: for example, it seems unlikely that early books will ever be able to be satisfactorily rebound by machine.

Finally, library conservation is, in that wonderful euphemism, a developing field. While interest in the field has grown dramatically in the past few years, it was only five years ago that the first conservation course was taught in a library school; the Library of Congress's broad conservation program is of approximately similar age; there are as yet no formal training programs for library conservators or conservation administrators; the National Commission on Libraries and Information Science has given the merest nod toward the problems of preservation, and so on.

We have seen, then, several major problems of library conservation: the amount of materials needing preservation is massive; the character of the materials, and, consequently, of appropriate preservation methods, is highly diverse; the need for conservation measures is urgent; conservation in any form is expensive; and the whole field of library conservation is underdeveloped. How then can we begin to tackle preservation of this vital segment of our cultural heritage in a useful way in an era of expanding needs and shrinking resources?

One way, clearly, is through cooperative efforts. Through permitting maximum utilization of the limited knowledge and skills available, through economies of scale where such are possible, and through the reduction in du-

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plication of effort, cooperative action can help to gain maximum benefit from the limited resources that we have to preserve our nation's collective memory. Indeed, the problems of preservation are so complex and massive that it may only be through cooperation that we can hope to tackle them on a scale adequate to reverse the rapid deterioration of our collections. Three areas in which cooperative effort may be productive are in acquisition, retention and preservation responsibility; reproduction; and physical treatment.

Acquisition, retention, preservation

One of the apparently inevitable facts of library conservation, one which is beginning to be discussed despite its equally inevitable unpopularity, is the division of collecting, retention, and preservation responsibilities. While one does not hear as much about the information explosion as one did a few years ago, and while some types of information are beginning to be disseminated in new, nonbook formats, there is no doubt that the rate of growth of information has slowed little if at all. At the same time, as Richard De Gennaro has opined, libraries are unlikely again to have the money for collections development that was characteristic of the booming sixties, at least for the foreseeable future. It would seem, then, that the only alternative to a broad decline in the quality of our library resources is for acquisition and retention policies to be coordinated among institutions, primarily in a defined geographical area, in order to make the size of collections which need to be preserved more manageable, and to free funds for the preservation of older materials already in the collections. Similarly, expensive preservation efforts should be allocated among cooperating institutions in the same way.

Some of these questions were addressed, in the framework of a proposed national program, by Gordon Williams in his 1965 report for the Association of Research Libraries. The lack of comment or action on that report, despite its distinguished authorship and auspices, may be a measure of the unpopularity of what libraries perhaps perceive as loss of individual sovereignty as well as of the overwhelming dimensions of the problem. ARL again tackled the question of preservation in its 1972 report by Warren J. Haas. Haas's proposals, although less threatening-sounding than Williams', have again elicited no broad call to action.

However, on the regional level, the groundwork for such a scheme is being laid by the Research Libraries Group, the consortium consisting of Harvard, Yale, Columbia and the Research Divisions of the New York Public Library. RLG's Serials Task Force is in the process of developing mechanisms for reviewing serials subscriptions and cancellations for titles which do not have to be in each of the four libraries, but for which one library's copy can be shared by all. In addition to saving money in subscription costs, such a program also of course has the potential for saving costly storage space as well. Similarly, the RLG Preservation Committee is attempting to add to these mechanisms for decision-making on serials criteria for preservation microfilming of backfiles of important serial titles. The amount of effort and good will required to establish and operate such practical cooperative action is considerable; indeed, it may not prove to be worthwhile for monographic materials. But the whole research library community can be grateful that the RLG Preservation Committee is making these pioneering experiments.

The Center for Research Libraries in Chicago is performing for its member libraries functions which are directly or indirectly in the interest of preservation. In addition to storing and providing access to lesser-used materials for its member libraries, CRL is in many cases making microfilm masters of the materials deposited there as well.

Reproduction

A second sector in which cooperative efforts can be of enormous benefit in the preservation of library collections is through reproduction of brittle materials and of materials for which wear and tear can be reduced by providing reproductions to users rather than originals. There is already a great deal of activity which, while not perhaps always thought of under the rubric of cooperative conservation, certainly aids that purpose. For example, commercial reprinting, whether in the form of individual hard-cover reprints or large microform libraries, has the effect of cooperative preservation in several respects. Preservation of the intellectual content is assured through dissemination of copies; the one-time costs involved are distributed over many user copies, and most libraries now either charge a reproduction fee, which may be used for further preservation work, or arrange for a copy of the reprint to replace the library's deteriorating original, or both.

Similarly, the *National Register of Microform Masters* (NRMM) and *Newspapers in Microform*, both published by the Library of Congress, are cooperative in that they rely on libraries to report items which have been filmed, and they can be used as mechanisms for distributing the cost of preservation filming by indicating where masters are available, thus eliminating the need for further original filming, which is more expensive than making copies from existing masters.

Reproduction is an area in which further cooperative effort would appear to have great and immediate potential for furthering the preservation of materials. The technology of reproduction is considerably better developed than that of physical preservation, and, as already cited, a number of mechanisms already exist.

The activities of the Research Libraries Group in this area may be indicative of some types of cooperative activity which could be useful on a regional scale. The RLG Preservation Committee has proposed a union list of microform masters held by the members, and a work-in-progress register to help avoid duplication at least among member libraries. Further, RLG is examining the possibility of joint storage of master microforms, an expensive operation which requires careful technical control of storage and handling conditions, and which seems to be difficult for individual libraries to achieve satisfactorily. Similarly, the possibility of a joint filming laboratory is being considered, another operation which is difficult for individual libraries to perform satisfactorily, for the same reasons.

While much of the initiative in the bibliographical control aspects of preservation filming would seem to be appropriate to the national level—for instance, mechanization of the NRMM—the areas of production and storage of microform masters to the best conservation standards would appear to be a particularly fruitful pursuit for regional consortia.

Physical preservation

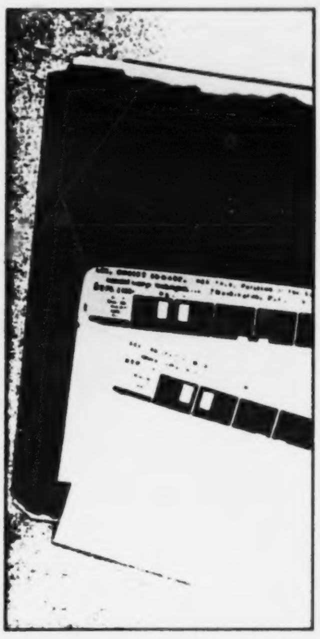
If the division of resources is faced with the difficulty of real local needs and perceived threats to individual sovereignty, the physical preservation of library materials faces enormous problems of underdevelopment and of cost. It is perhaps just for these reasons that the idea of cooperative or regional conservation facilities is being discussed with increasing frequency.

Lest it seem that some of my statements imply that I am not in favor of regional or cooperative conservation centers, I want to emphasize that I think that such centers are a vital approach to the delivery of conservation services to libraries, archives, and historical societies. Indeed, it is my hunch that they will in time be one of the most important mechanisms for providing actual conservation services.

First, what is a regional conservation center? It could be any of a number of things. There seem to be three categories of service which a regional center could provide: consultation and advisory services, treatment of materials, and education and training. It could have one of several types of sponsorship. It could be a closed cooperative facility, established specifically to serve the needs of its sponsors, or it could be a membership organization in which new members were accepted, and in which the members would make some contribution to overhead or specific programs. An example of the latter type of organization is the fledgling Ohio Conservation Consortium, sponsored by the Ohio Historical Society, which provides services for the consortium members. For an annual membership fee, members obtain various consultations and advisory services, while actual treatment of materials is charged for on a cost-plus basis. Or it could be a fully regional center in that it served, as the New England Document Conservation Center does, any not-for-profit cultural institution in the defined geographical region. In this case, the center might be similar to a business except in that it was not operated for profit, and that it served only not-for-profit institutions.

Unfortunately, the current enthusiasm for regional conservation centers appears to be based in part on some misconceptions. I would like to discuss two of those. The ethical questions involved in the treatment of cultural property in general and books and manuscripts in particular—questions such as when and how much a book should be altered in the interest of preservation—have hardly begun even being asked. Parenthetically, I suspect that conservators and historians of the book think of the phrase "benign neglect," despite its original invidious connotations, when they are fortunate enough to come upon books and manuscripts which are in unaltered, even if deteriorated, condition. Ill-chosen, inept, or inadequate treatment almost invariably causes far more problems than it solves in the long run. What I am trying to suggest is that assuming everything possible is done to provide good environmental and storage conditions for books and manuscripts of artifact value, just any kind of restoration treatment is not necessarily better than no treatment at all. This may have a bearing on the advisability of establishing cooperative or regional treatment centers at present, particularly in light of the limited knowledge, skills and ethical frameworks thus far available.

The second cautionary point about regional conservation treatment centers concerns cost. The absence of profit from the work performed is an obvious advantage for the not-for-profit—and chronically underfunded—educational and cultural institutions for whose services regional centers would be established. But it is important to remember that conservation treatment, particularly for individual items, is inherently expensive, and there is little likelihood that it will become less so. It takes just so many hours to rebind an early book suitably, whether the binding is done in a profit-making or a not-for-profit organization. Thus while it is true that cooperative conservation treatment may save some money over the cost of work of comparable caliber done commercially, libraries are not likely finally to save large amounts on quality work. There is, however, some possibility of cost saving through offering certain types of simple but conservationally sound treatments which are not available commercially. I fear that in some cases librarians' enthusiasm about the idea of regional centers may be based on the false notion that they will be able to obtain treatment at substantially less cost than is presently possible. I have in fact seen one proposal for a center which claimed that it could save up to 75 percent over work done commercially. If that notion were true, and if my arithmetic is correct, it would mean that commercial conservation operations are making 300 percent profit on their work. If *that* were true, I suspect that there would be more people in the restoration business than there are at present.



The production and storage of microform masters—a "fruitful pursuit for regional consortia"

The National Conservation Advisory Council is discussing the implications of regional or cooperative centers as an efficient means of providing conservation services which meet a high standard at as reasonable cost as possible for all types of cultural property—museum objects as well as library and archival materials. The Council has issued a report on regional centers, and while it is specifically designated as being applicable to centers for treating museum collections, some of its discussion is certainly applicable to centers for libraries as well. The Council's general report, entitled *The Conservation of Cultural Property in the United States*, sounds a cautious note about attempting to establish treatment facilities before there are enough properly-qualified people available to direct and staff them. Similarly, the American Institute for Conservation of Historic and Artistic Works, in a statement on national needs in conservation affirmed by that organization in 1975, recommends a "considered sequence of priorities," with training of conservation personnel being the first priority, without which others cannot proceed effectively. Furthermore, NCAC is studying the advisability of establishing a national conservation institute. One of the possible functions of such an institute might be to provide various kinds of back-up services for regional centers, and at the same time, to help to maintain standards of quality.

Considering particularly the lack of adequately-trained personnel available, I am not at all certain that it is possible at the present time to establish additional regional treatment centers which are capable of maintaining adequate standards of quality. I am fairly certain, however, that such centers will be a major means of providing conservation services in the future.

Delicate balancing act

Many of the approaches to preservation discussed here could be done on a national scale, perhaps accruing even greater benefits than would be the case with regional cooperative effort. However, there are some limitations to national programs, most notably where physical access is required, as in the case of preservation depositories or physical treatment facilities. There seems to be little question, however, that nationwide planning and coordination will be required to tackle problems of this scale effectively and to reduce duplication of effort. Nevertheless, it also seems apparent that cooperative action on a somewhat smaller scale—regional or intratype—is a logical and probably necessary prior step. In addition to being of a more manageable scale, such a scaling-up step will help, as Warren J. Haas has pointed out in his Association of Research Libraries preservation report, to sort out the more useful and productive programs.

The National Commission on Libraries and Information Science seems to support various types of cooperative information access activities on state or regional bases, but points out the serious potential for incompatible systems, for which federal standards are required, and the problem of duplication of effort, for which a federally supervised interconnecting network may be the answer. Similarly, the National Conservation Advisory Council has suggested, without spelling out details, that one of the functions of a national conservation institute might be to help maintain standards in regional treatment centers.

A rather delicate kind of balancing act may be required to encourage local and regional initiative in cooperation, without unduly compromising the possibilities of a national program. While there are inevitably drawbacks and limitations to imposing general standards over a broad field, there are benefits which can probably be gained in no other way.

Summary

The massive problems of library conservation—problems of scale, of cost, of underdevelopment—can only be approached effectively, it seems clear, through cooperative effort. There are beginning to be bases for cooperative effort established, some of which are designed specifically for conservation activities, some of which have conservation as one of several aims, and some of which may more-or-less incidentally provide useful elements in the total conservation picture.

It seems to me that, aside from the ever-present problem of money, there are at present three major inhibitions to realizing the full potential for effective cooperative conservation programs. The first, and perhaps most difficult, is the problem of allocation of responsibilities for preserving individual items or well-defined categories of items among different institutions. While it is pretty well realized now that no one institution can preserve its own entire collections single-handedly, each institution is, understandably enough, reluctant to commit itself to a program which will mean that the other guy's copy of X will be carefully preserved, while their own will have to be allowed to continue to deteriorate. We can hope that improved preservation technology will help in the future to avoid some of these kinds of painful decisions, but it may be dangerous to place too much faith in the wonders of technology.

The second major problem that we face, is the terrible lack of people adequately trained in physical preservation, and the lack of training programs to begin to fill that need. And by physical preservation, I mean not only people qualified to restore rare books, but particularly people who are knowledgeable about mass preservation methods, about proper storage and environmental conditions, and about the preservation of nonbook materials such as photographs.

The third major area of need that I see is national initiative in preservation. There is much to be done on a national scale, particularly in the area of bibliographical control of preservation—devising mechanisms to attempt to insure that whole chunks of mankind's record will not just disappear.

The Proposed National Preservation Program of the Library of Congress

AS ANNOUNCED at the Chicago Conference of the American Library Association last July, the Library of Congress is currently developing plans for a national preservation program to assist in the conservation of deteriorating materials in the nation's libraries. The program now envisaged will address itself to three major problems:

I. Preservation of the intellectual contents of materials so embrittled that they cannot be used without damage, but not of sufficient intrinsic value to justify preservation in the original format. Pending the development of new and improved technology a nationwide microfilming program is recommended as the most appropriate and economically feasible method of preserving most such materials. LC will propose the development of a national preservation microfilming project with master negatives stored under ideal environmental conditions. Selections of materials to be microfilmed and preserved will require a priority assessment program to identify items for microfilming and to establish priorities. In addition, a comprehensive and effective bibliographic control system and widespread dissemination of the bibliographic record are essential elements of the proposed program.

II. Preservation of rare and intrinsically valuable materials in the nation's libraries which require the attention of expert paper conservators. Because of the dearth of trained paper conservators in the United States and the lack of training facilities for both paper conservators and rare book conservators, the Library of Congress proposes the establishment of a comprehensive training program in cooperation with local academic institutions. At a later date, as qualified conservators become available, the establishment of regional conservation centers in appropriately located libraries is recommended.

III. Preservation of present and future publications which are being printed on paper with a life-expectancy of 50 years or less. In this instance, preservation might take the form of obtaining one copy of all U.S. publications for storage under ideal environmental conditions. A second alternative currently being explored by LC is the possibility of obtaining microfilm copies of all materials in advance of publication.

LC's proposed national preservation program will be the subject of a two-day invitational conference held at the Library of Congress in December 1976. It is expected that a report of this conference will be published shortly thereafter.—***Frazer G. Poole, Assistant Director for Preservation, Library of Congress***

The Future of Cooperative Preservation Microfilming

Margaret S. Child

WHEN ONE BEGINS TO SURVEY the history of the paper preservation movement in this country, it is soon noticeable that the Council on Library Resources (CLR) has played an important, if somewhat sporadic, role in the development of that movement. CLR's involvement goes back to its support of the pioneering research on paper deterioration by the Barrow Laboratory in the 1950s. An article by Nancy Gwinn in the March 1981 issue of *College & Research Libraries* provides an overview of that involvement.[1] Most recently CLR has been instrumental in convincing the Exxon Education Foundation to provide a grant of $1.2 million to establish a cooperative facility in the Mid-Atlantic states for replicating deteriorating materials, with additional funds for planning national preservation initiatives and educating a broader public about the issue.

More recently, although the main thrust of the council's funding has been directed toward the solution of other basic problems confronting American libraries, the preservation issue has not only *not* been forgotten, but some basic strategic thinking has been done, with council support, about ways to tackle it. The first major initiative was the formation of a task force in 1981, jointly sponsored by CLR and the American Association of Universities, to examine the dimensions of the preservation problem in research libraries and to suggest possible remedial measures. Its unpublished report served as one of the background papers for a conference held a year later at Wingspread to discuss an overall agenda for research libraries and their users as they moved toward the twenty-first century. That in turn was followed by another meeting, at the Wye Center in Maryland in October 1983, which focused exclusively on the collection and preservation of library materials. The two papers resulting from these conferences have been published and are available from the council, and I hope that many of you have read them.[2]

The latest manifestation of the council's interest in preservation is its invitation to me to serve as a part-time consultant, to provide staff sup-

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Edited version of a paper presented at the RTSD Preservation Microfilming Committee program, "Cooperation in Preservation Microfilming—Past, Present, and Future," on June 25, 1984, by Margaret S. Child, Assistant Director and Manager, Research Services, Smithsonian Institution Libraries, and consultant on conservation and preservation to the Council on Library Resources.

port for an effort to identify and facilitate both short- and long-term projects, which will bring us to a point ten years from now where we can say that the content of the bulk of our collections has been saved for posterity. Initially, most of my time was spent catching up on what has happened in the field of library preservation in the last two years. Here are a few of the points that have emerged from that review.

First of all, I want to stress the fact that the idea of "cooperative preservation microfilming" derives from the premise that libraries must soon transfer their holdings to a medium less fragile than the nineteenth-century version of paper which was the fatal by-product of the enormous growth of literacy of that period. I *know* all the objections that can be raised about microforms, and I *feel* most of them acutely, but I do not intend to rehearse them here. That would be an exercise in futility, for the fact remains that, at this time, there really is no other practical choice open to us.

Microform is currently the best option we have because, technically, it is relatively straightforward to produce, because standards are available and generally accepted about what kind of film to use and how to process and store it, because there are evolving bibliographic procedures for describing it and mechanisms in place which could potentially provide access to those descriptions, because it can be copied cheaply and easily, and because its per-item cost is moderate. In addition, silver halide film has proved its viability as a long-lived medium if one adheres to production and storage standards. Hovering on the technological horizon are alternative mechanisms, which might be more comfortable to use and which offer the possibility of higher-quality replication. But some of their qualities are as yet untested, *and* they are not yet available at an affordable cost.

I feel very strongly that we must not delay filming because we are waiting for some wonderful technological breakthrough, which will enable us to continue to fill our shelves with comfortable, convenient books. Fortunately, it seems likely that the microforms created today will be relatively easily replicated by the next stage of technology. In short, our current efforts will probably not be wasted no matter what follows microfilming. Moreover, whatever comes next, everything I am about to say concerning the conditions necessary to mount a successful national preservation microfilming campaign is equally applicable to another technology, such as optical disk.

Secondly, I would like to suggest that there is very little reason to continue contemplating the extent of the problem in order to justify beginning a massive national microfilming program. We already know, from the surveys done at Stanford, Yale, the New York Public Library, and the Library of Congress (LC), that, at the very least, 25 percent of the collections in any research library in this country will be brittle and are therefore candidates for immediate transfer to another medium. It is also abundantly clear from the results of these surveys that the problem is rapidly going to become very much worse, because all but perhaps 10 percent of the remainder of the collections needs to be considered for prompt deacidification, or it too will have reached a stage of embrittle-

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ment where copying is the only solution. Faced with statistics, no matter how gross, which indicate that a task of such magnitude confronts us, we would be foolish to expend any more manpower or funds to refine or confirm them with further surveys. The only exception would be the cases where it is necessary to provide local data to convince administrators of the need to budget for remedial measures. In all other instances, it seems a more practical use of limited resources to turn our energies and ingenuity to devising action strategies and developing the infrastructure to sustain them.

I do not wish to suggest, however, that I am advocating plunging blindly ahead in the happy conviction that microfilming is a universal panacea for the preservation problem. If a national preservation strategy is to be successful, microfilming should constitute but one element within a complex of comprehensive, systematic preservation programs undertaken individually by every repository in the country holding significant research material. Such programs must ensure that *all* documentary resources are housed under proper climate-controlled conditions and protected from damage by light, dirt, and careless handling, that binding standards are carefully thought out and applied, that small repairs are made promptly, and that more seriously deteriorated materials are appropriately protected until they can receive remedial treatment or be filmed. I need not repeat all the details of such an in-house preservation program here because they are admirably outlined in the Association of Research Libraries' (ARL) and the Society of American Archivists' manuals on preservation administration.[3] I do, however, want to emphasize that microfilming is only *one* of the treatments at our command for dealing with the plague of paper deterioration, just as radiation therapy is but one of the options to be considered by an oncologist confronted by a malignancy. To carry the analogy a bit further: microfilming may not be an ideal or very pleasant method of treatment—as a treatment it should be used in combination with a whole range of therapies including preventive care; nonetheless, in the last analysis, its value as a treatment is indisputable in those cases in which without it the patient would die.

There is ample evidence that certain key elements are already in place, upon which a national program for the preservation of deteriorating materials can be erected. Like the developing nations, we have slowly been building an infrastructure of trained personnel, viable technologies, available equipment, and operational methodologies to a level which will permit "take-off." We are not there yet, however, because there are still some gaping holes in the infrastructure. As a result, we need massive infusions of "foreign aid"—subsidies from government and private foundations, direct funding by local and national governments, and the diversion of institutional funding to preservation programs of all kinds—in order to put in place those missing links and pay for the start-up costs of actual filming projects.

Nonetheless, despite these deficiencies, it can be argued that a national preservation filming program is already under way, thanks primarily to the efforts of the Research Libraries Group (RLG), the American Theological Libraries Association (ATLA), and individual libraries, such as LC, New York Public Library, and Harvard, which have a long tradition of filming their deteriorated materials in large numbers. Indeed, these efforts suggest very clearly that the national program is not only already in being but that it is and will of necessity be a distributed rather than a monolithic campaign. If it looks rather like the distributed bibliographic network with which we have all become familiar, that should not be very surprising because that is the model which seems to work best in a large, diverse, and decentralized country such as ours.

However, the fact that a national filming program in this country will be simply the sum of myriad individual or cooperative programs means that a systematic effort will be needed to insure that everyone is playing by the same rules and to create a structure within which all efforts can be coordinated to prevent overlap, wasteful repetition of effort, or tangential undertakings. Some rules are already in place: standards have been developed which deal with the production of films and with storage environments. Andrew Raymond of the Northeast Document Conservation Center is currently at work for ARL, with funding from the National Historical Publications and Records Commission (NHPRC) and the Mellon Foundation, to produce a manual which will provide clear, comprehensible guidelines to library or archival staff wishing to strengthen an existing program or to develop a microfilming program for their institutions, either in-house or by contracting out.

In another area, RLG has developed standards for the bibliographic description of preservation microforms by utilizing the potential of the 007 field of the MARC format. It offered the definitions of each element to LC, and these were eventually revised and approved by the joint committee on Representation in Machine-Readable Form of Bibliographic Information (MARBI). RLG has also made it mandatory for all its members to state, when cataloging a microform, whether a film is a preservation master, another master, or a service copy. In addition, the Research Libraries Information Network (RLIN) software has been enhanced to permit the generation information to be displayed more obviously, as well as to allow easier searches for master negatives. Finally, RLIN users can record in a new field for "queueing date" the fact that they have decided to film an item and have agreed to do the actual filming within a year of that decision. Unfortunately, OCLC has as yet made no policy decisions about the use of the 007 field and, as far as I can tell, has provided no specific encouragement to catalogers in its member libraries to record data on microforms. As a result, such data are not being systematically collected from those libraries either on a current basis or as part of a retrospective effort. Another impediment to easy access to all bibliographic records for microforms is caused by the slowness with which the linked systems project is being completed and particularly by OCLC's lack of participation to date.

Other major gaps in the bibliographic infrastructure remain at LC, although there is serious commitment there to moving forward on a number of fronts, and thus it seems likely these will soon be plugged.

First of all, LC has recently started to do machine-readable minimal level cataloging for the microforms that it adds to its collections and to produce tapes of this data for distribution. This process is now being extended to the preservation films currently produced by the library itself. Moreover, there are plans to go back and retrospectively enter records for films in those areas covered by the RLG projects. Easy access to data on all the master microfilms that have ever been created by LC should eventually be provided both online and in COM. In yet a third area, LC has subsumed the *National Register of Microform Masters* within the National Union Catalog (NUC) and plans to accept records in machine-readable form from contributing libraries and publishers.[4] However, because of OCLC's reluctance to agree to LC's redistribution of such records from *its* member libraries in machine-readable form, they are currently available only on COM. A similar strategy is being followed for serial records, including newspapers, with distribution within *New Serial Titles*. Finally, a project to produce a retrospective cumulation of the *National Register of Microform Masters* from 1976 will begin shortly.

All this somewhat confusing and rather tedious detail has been included simply to emphasize that the bibliographic infrastructure is as yet far from ideal. Indeed, the goal of having a *single source search capability* for microforms seems at the moment an almost impossible dream, but we must nonetheless continue to press towards it. Individual institutions, such as Harvard, which have steadfastly pressed forward with filming over the years should be helped to make the bibliographic data on their retrospective files of master negatives generally available through the bibliographic utilities as well as through the *National Register of Microform Masters* section of NUC. There must also be a parallel commitment on the part of all filmers to provide copies of the films to other libraries as needed.

Standards and a solid bibliographical base are not the only prerequisites for a national preservation filming program to become a reality. Also required are more cooperative *structures* to organize segments of the effort. These have waxed and waned over the years, but they are still an essential organizational device if filming is to go forward both coherently and reasonably quickly. Cooperative structures can have a geographic basis, such as the preservation program currently being developed by SOLINET, which could eventually include a filming component. They can also have a subject basis, as in the ATLA project or the effort to preserve Indian tribal records now being considered by NHPRC. They could also be linked to a RECON cataloging project; something of the sort now seems to be under consideration for published musical scores and/or sheet music. Or, they can simply be based on an existing cooperative organization of institutions with similar purposes and interests, such as RLG, the Center for Research Libraries, or a self-selected group of ARL libraries. There are also undoubtedly other models which could be identified, but I think I have made my point.

I do not wish to suggest, however, that all filming must be channeled through a cooperative program. The current programs of individual repositories to film deteriorating materials as they are discovered and determined to be bibliographically significant, yet not already available as a reprint or in film, are to be applauded. These over-the-counter, ad hoc efforts should certainly continue and indeed should be increased, with the proviso that bibliographical information for the newly created films must be input to the appropriate database and be reported to NUC as promptly as possible. Similarly, the efforts of commercial microform publishers should be encouraged, with the same caveat that such projects must include making the bibliographic records available online.

A fourth requirement of an effective national program is the establishment of additional regional centers dedicated to preserving library and archival materials. In addition, our one existing center, the Northeast Document Conservation Center, should be strengthened in order to handle the high volume of filming generated by an increased number of cooperative programs and stepped-up institutional efforts. Filming, even the high-quality archival filming we are talking about here, is a mechanical process, very well suited to a high-volume mode of production. Despite the additional costs of transporting materials to a regional center, it seems to me the most efficient way to process the millions of volumes which will need to be filmed in the next decade. This opinion is confirmed by the positive endorsement of regional centers in the returns received thus far in the ARL survey. Such centers could ensure the quality of the film initially, could devise methods for periodic sampling to guard against deterioration, and could potentially also provide mass deacidification treatment for books not yet so brittle they must be filmed. At the moment, the one regional center with such a microfilming capability is seriously hampered by inadequate space, insufficient staff, and lack of equipment. These deficiencies need to be remedied so that the Northeast Document Conservation Center can indeed serve its region effectively. In addition, new centers should be set up, especially in areas where there is a high concentration of research institutions with voluminous collections to feed into them.

One segment of the infrastructure in which significant progress has been made in recent years is training. That effort must be continued and even stepped up. Since a cooperative national preservation filming program is only one element in an overall effort by every repository to preserve its collections, additional preservation adminstrators are needed to run institutional, regional, or cooperative programs as are additional conservators to treat those items which should be retained in their original format. In addition, specific training is needed for those who will manage and staff filming programs and centers, and it is good to know that plans for such training are going forward under the aegis of RTSD.

As part of the effort to construct a solid framework of preservation awareness within which filming programs can be organized, a broader training program should also be mounted and aimed at library and archival administrators, faculty of library schools, and the entire staff of libraries and archives. Some of this can be in-house training by the preservation administrator. Some should be specialized programs such as those now given by the New York Botanical Garden or Johns Hopkins conservation laboratories staff. Some should be basic workshops such as those offered by the Society of American Archivists or the Northeast Document Conservation Center field services officer. Some should be seminars for middle managers, such as the one recently offered jointly by ALA and LC. Also needed are opportunities for on-the-job training by means of internships like those offered some years ago by Yale, as well as the more advanced kind currently being underwritten by the Mellon Foundation.

In addition to bringing the library and archival professions up to speed with a variety of kinds of expertise in the preservation field, a national program will also have to include a public education element in order to muster the broadest possible understanding of, and support for, a national campaign to solve the preservation problem. A number of publics need to be targeted by this effort, especially scholars, who are the primary users of the materials endangered, who have the most to gain from such a program, but who remain remarkably unsupportive of any kind of reformatting. University and other institutional administrators also need to be persuaded that there is indeed a crisis serious enough to demand diversion of substantial amounts of funding to preservation from other purposes or to give top priority to grant applications for preservation. Members of boards of trustees, friends groups, historical societies, and other similar bodies must become enthusiastic advocates in their communities for the campaign to preserve our intellectual heritage. And finally, the general public needs to be alerted that the threatened loss of our collective memories has at least as commanding a claim to its attention and its tax dollars as the deterioration of historic buildings or the natural environment.

Closely allied to training and education is information exchange. In order to maximize scarce resources, more needs to be done to develop mechanisms for the lateral dissemination of information. The current proliferation of guidelines and manuals, training materials, information packets, and fact sheets on specific preservation issues is very wasteful. As LC's National Preservation Reference Program gears up, it is to be hoped that it will assume the responsibility for collecting the documentation developed so far, distributing copies of the truly useful, identifying models deserving of emulation, circulating the results of product testing, and in general playing a key role in getting the best possible information out to those who need it.

How are all these initiatives going to be coordinated? In part, as I have already suggested, by making use of existing standards, organizational structures, and institutional programs; in part by expanding upon what already exists; and in part by creating new rules or entities as they are needed. As with the Bibliographical Services Development Project, CLR stands ready to facilitate this effort, to sponsor meetings for making decisions on critical issues, and to underwrite research such as the development of cost data needed to support administrative decisions. CLR is also particularly concerned about the need to mount a public education campaign. In addition, it will exert its good offices toward increasing the amount of public and private money flowing to the preservation of documentary resources.

However, in conclusion I want to stress that neither CLR, as an organization, nor its president nor I, as individuals, has an overall strategy to offer. Neither are we advocates of a particular governance structure. For better or worse, there is no grand design, no overarching plan, which tells us all where we should be and what we should do at any given moment. I personally think that is just as well. I hope this paper has identified most of the basic elements which must be in place to give a national preservation filming program the momentum needed to reach "takeoff," namely, (1) an affordable, well-understood, and generally accessible technology; (2) commitment from librarians, archivists, administrators, and scholars to transferring the information content of large parts of collections to another medium in order to save it; (3) adequate funding from individual repositories, institutions, foundations, and state and local governments; (4) accepted standards and procedures; (5) rapid and easy access to bibliographic data on what has already been filmed; (6) cooperative structures to organize and accomplish the work; (7) trained personnel; and (8) public understanding and support.

There is certainly more than enough to do, and there should be something to suit the skills and interests of almost everyone. So all we have to do is set to.

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(NOTE: ca. 1981)

CCAHA CONSERVATION CENTER
FOR ART AND HISTORIC ARTIFACTS
260 SOUTH BROAD STREET
PHILADELPHIA, PA 19102 (215)545-0613

PURPOSE

Located in Philadelphia, PA, the Conservation Center for Art and Historic Artifacts is a non-profit, tax-exempt conservation center, created to serve hte needs of cultural organizations throughout the United States. Incorporated in 1977, the Conservation Center has developed one of the most modern treatment facilities of its kind in the country. The Center specializes in the conservation treatment of art and historic artifacts on paper, photographs, library and archival materials, and other related materials such as parchment and papyrus.

The Center is dedicated to serving the diverse needs of its membership. While primarily a conservation treatment facility, the Conservation Center also offers a variety of programs to assist its member institutions in developing and implementing long-range preservation planning and stabilization of collections. The Center's commitment to treatment, educational, and consulting services of the highest quality and efficiency makes it a vital resource for cultural institutions, with or without in-house conservation departments.

MEMBERSHIP

Membership in the Conservation Center is open to all non-profit, tax-exempt organizations, including museums, historical societies, libraries, archives, academic institutions, and private foundations. The membership is primarily from, but not limited to, the Mid-Atlantic states region.

Private collectors who have been individual or corporate members of member institutions for at least the past three years, as well as institutional staff may also use the Center's treatment services. However, treatment work from private sources is contracted on a non-priority basis and must be of educational value to the Center's staff and/or interns.

SERVICES

Conservation Treatment The Conservation Center offers treatment services for art and historic artifacts on paper, photographs, library and archival materials, and other related materials such as parchment and papyrus. The combination of a sophisticated laboratory facility and higly trained staff provides superior treatment services for routine to highly complex conservation problems.

Consultation A variety of consultation services are available to the membership. The Conservation Center has initiated a survey program to assist member institutions with both short-term and long-range preservation planning. Through in-depth examinations of individual objects, as well as overviews of environmental, storage, and display conditions, institutions can prioritize their preservation needs. By targeting specific needs, the survey also serves as a valuable tool for budget development and grant application. The Center's staff is also available for individual consultations and referrals for specific conservation problems.

SERVICES, cont'd.

Educational Programs Qualified institutional personnel can take advantage of workshops and seminars designed to provide essential information and techniques for long-range preservation planning and stabilization of collections. With the knowledge gained through these programs, institutions can begin to assess their conservation needs and develop in-house preservation plans.

Internships In cooperation with academic conservation training programs, the Conservation Center provides intern positions for qualified students specializing in paper conservation.

Emergency Assistance Emergency assistance in areas of the Center's expertise, as well as recommendations and referrals for other specialized areas of conservation are available.

OPERATIONAL PROCEDURES

The Center is operated on earned income, supplemented by contributions and grants from private and federal sources. Hourly and per diem rates reflect labor, materials, and overhead costs.

Objects entering the laboratory are thorougly examined by the conservation staff. Written reports are provided to the owner, both before and after treatment, detailing condition, proposed treatment, cost estimate, and actual conservation treatment. Registration, accessioning, and insurance coverage, as well as photographic documentation both before and after treatment are standard procedures for all objects.

FEES

- All members pay an annual dues of $25.
- Conservation treatment services, examinations, and individual consultations are contracted on an hourly basis. The rate for member institutions is $35 per hour; the rate for private individuals is $45 per hour.
- Survey, workshop, and seminar programs are contracted on a per diem basis of $245.
- Fine arts insurance coverage for all work on the Center's premises is levied at a rate of $.10 per $100 valuation per month, unless a Waiver of Subrogation is supplied from the owner's insurance company.

STAFF

Marilyn Kemp Weidner, Director of Conservation and Chief Conservator of the Center, is internationally respected for her leadership and innovations in the field of paper conservation. Mrs. Weidner had over 20 years of experience as a private conservator and teacher before creating the Center in 1977. Abby A. Shaw, Associate Director of Administration and Education, has a Master's degree in Art History and seven years of previous experience in museum work and education. The staff consists of experienced and professionally trained conservators holding Master's degress from academic conservation training programs, and technical and administrative support services.

STAFF, cont'd.

Marilyn Kemp Weidner, Director of Conservation/Chief Conservator; Certified Conservator of Art on Paper, American Institute for Conservation of Historic and Artistic Works; Fellow, International Institute for Conservation of Historic and Artistic Works.

Abby A. Shaw, Associate Director of Administration and Education; M.A., University of Michigan.

Debbie Hess Norris, Assistant Conservator; M.S., Winterthur/University of Delaware Art Conservation Program.

Lois Olcott Price, Assistant Conservator; M.S., Winterthur/University of Delaware Art Conservation Program.

Elizabeth Kaiser Schulte, Assistant Conservator; M.S. Winterthur/University of Delaware Art Conservation Program.

Holly Maxson, Conservator/Apprentice; B.F.A., Tyler School of Art, Temple University.

Mary Schobert, Archival Technician; M.F.A., Southern Illinois University.

Kathy L. Mallow, Records Coordinator; B.A., University of Delaware.

BOARD OF DIRECTORS

The administration of the Conservation Center is governed by a Board of Directors consisting of five public members and seven members selected from the Center's diverse membership on the basis of geographical distribution, institutional size and holdings, governing authority, and commitment to conservation.

Members Representing the Membership

Joseph A. Boissé, Director, Temple University Libraries, Temple University, Philadelphia, PA

Marigene H. Butler, Conservator, Philadelphia Museum of Art, Philadelphia, PA

Robert H. Frankel, Director, Delaware Art Museum, Wilmington, DE

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Dennis K. McDaniel, Director, Municipal Museum of the City of Baltimore (Peale Museum), Baltimore, MD

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BOARD OF DIRECTORS, cont'd.

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Howard A. Wolf, Trustee, Philadelphia College of Art, Philadelphia, PA

FOR FURTHER INFORMATION, CONTACT:

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Visits are by appointment.

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COOPERATIVE CONSERVATION EFFORTS IN OREGON

This is the fourth in a series featuring preservation activities in various institutional settings – Ed.

Like most other state historical societies, the Oregon Historical Society has for years possessed a conservation and preservation awareness without necessarily having a budget to fully act upon that awareness. That is, until recently.

The conservation of manuscripts and books has traditionally been under the supervision of the Manuscripts Librarian, who is responsible for training and supervising volunteer restoration technicians. While the technicians chosen for this program were screened and trained carefully, cramped workshop space with limited laboratory apparatus restricted possible operations to washing, tissue lamination, patching and Mylar encapsulation. What was performed was done well and thoroughly, but technicians and supervisor alike felt frustrated at these limitations.

Enter Jack Thompson, a paper and book conservator in Portland, Oregon, who for nearly seven years consulted with OHS on conservation questions, and since going into business for himself four years ago has given his time freely to Society staff. We in turn have gladly recommended him to other repositories and private individuals needing preservation work. Jack and Cathy de Lorge, OHS Manuscripts Librarian, discussed possible funding and staffing arrangements for a hoped-for conservation laboratory, something which would obviously take large amounts of salesmanship, money and hard work. The OHS administration was supportive of the theory, but financially realistic about the necessary commitment.

We therefore submitted grant proposal outlines to funding agencies, who without exception suggested that a regional laboratory system be initiated. We were convinced, however, that with so few working models of this type in the U.S., we would be ill-advised to make that commitment without dealing with our own preservation and conservation needs first. Then two coincidences occurred which enabled us to move forward with our plan.

The Oregon Historical Society had recently rented adjunct storage space for its museum and library collections. A former mercantile warehouse, it had everything: security and sprinkler systems, plumbing, an elevator large enough to hold a truck, adequate humidity and temperature range, and excess space. As it happened, Jack's laboratory space lease was due for renewal, and suddenly it struck us – Why not let Jack move his laboratory into a segment of the storage space, and in exchange for the equivalent rent and utilities perform conservation duties?

All the Society had to do was partition off and secure Jack's space and provide plumbing and electrical connections. This was, of course, a small expense for having a 2,700 sq. ft. conservation laboratory equipped with a conservator, his reference library, microscopes, chemistry lab, tools, supplies, miscellaneous equipment and coffee pot.

A lease agreement was drawn up and signed, and Jack now provides the Society with the equivalent of one day per week of services. He is considered an adjunct staff member, but is totally independent to carry on consulting and conservation duties through Thompson Conservation Laboratory. OHS receives low-cost professional care for its collections, rates to other customers will not have to be increased as rapidly to offset inflation, and Jack will have more time to conduct research on leather consolidants, paper deterioration, book structures and technician training methods. He has already hired a part-time paper conservator to assist him and free his time for this research.

In addition, Jack has assumed the training and supervision of the Society's restoration volunteer-technicians. They can go as far as their own determination and interest carry them now, since there are no more laboratory and time limitations for their supervision.

Since the agreement went into effect in June 1979, volunteer technicians have restored numerous documents and books, and a museum staff member under Jack's direction has restored items as diverse as a beaver hat, a hat box and a satin vest. The additional lab space afforded Jack under this agreement enabled the Laboratory to host a book restoration workshop conducted by Bernard C. Middleton. This brought together binders and conservators from Oregon, Washington and Idaho to study re-backing techniques on pre-1800 printed books generously provided by Mt. Angel Abbey.

In November, Jack also conducted the first of eight disaster action team development workshops sponsored by Northwest Archivists, Inc. and funded by the National Endowment for the Humanities, Division of Research Grants.

When Jack set up his own shop in 1975, he fully realized the paucity of conservation literature in the Pacific Northwest. He therefore began to build his own reference library, which is now one of the largest of its kind on the West Coast. Although the collection is strongest in bibliography, paper and chemistry, also represented are the fine arts, textiles, material culture, architecture and archaeology. The collection is large enough now that it has become necessary to catalog it, so Jack recently hired Elizabeth Chambers to administer it.

Jack also established the Caber Press in January 1980, with Ms. Chambers as

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Cathy de Lorge, Manuscripts Librarian of the Oregon Historical Society, and Jack Thompson, paper and book conservator.

OREGON cont.

editor, to publish the Thompson Conservation Laboratory bibliography and then a series of 40-60 page pamphlets. These pamphlets will consolidate material from the reference collection, most of which is out of print, and will assist conservation administrators put state-of-the-art conservation practices and materials into historical perspective. Scheduled publications include a history of the development of bleaching technology, certain aspects of 19th century machine papermaking, and proper fiber preparation for hand papermakers and artists.

In addition, Caber Press will publish occasional manuscripts by other authors if the subject matter appears to be of value to the conservation community. Manuscript topics being considered at this time include hand papermaking with unusual fibers, paper marbling as a contemporary art form, and the history and chemistry of paper marbling.

Obviously, the exchange has already worked to the advantage of both Jack Thompson and the Oregon Historical Society, and we anticipate yet more growth and mutual benefits. Most important to us, though, is the fact that we did not have to take on a larger financial commitment than we were ready to assume, and that we do not have to justify to any granting agency what our progressive steps are. Our conservation and preservation needs are being handled cooperatively, at a sensible pace, and in our own way.

Cathy de Lorge
Jack Thompson

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The Rise and Fall and Rise of Cooperative Projects

Nancy E. Gwinn

PRESERVATION MICROFILMING began in earnest in the United States in 1938, a year that also marked the beginning of cooperative filming projects. World War II gave impetus to great foreign acquisition projects cosponsored by the Library of Congress (LC) and other scholarly organizations, but other patterns of cooperation also developed. The American Library Association (ALA) and the Association of Research Libraries (ARL) began the first of a series of efforts to achieve national consensus on filming priorities in the 1950s; the earliest and most long-lasting involved newspapers. Start-up projects and planning efforts rose steadily in the 1960s, as funding from the Council on Library Resources (CLR) helped establish tools and methods to support a nationwide effort. By the early 1970s, multi-institutional cooperative activity began to diminish, although a firm foundation of informal bilateral agreements, standards definitions, and mutual consultations was in place. The 1980s have brought a new wave of cooperative preservation microfilming projects. Examples are the U.S. Newspaper Project, and projects coordinated by the American Theological Library Association, the Research Libraries Group (RLG), and the American Philological Association.

Picture if you will a typical graph whose horizontal axis measures a fifty-year period. The points plotted on the graph show a typical "rise and fall" pattern, similar to automobile production or the stock market. The rise and fall of cooperative preservation microfilming projects can also be loosely plotted on such a graph. The horizontal axis measures, in decades, the years from the mid-1930s to the mid-1980s. However, the vertical axis is, unfortunately, much less specific—in fact, it measures an intangible, impressionistic quantity called *cooperative activity,* a term that should be defined to include not only specific cooperative projects, but also serious planning efforts to coordinate multi-institutional preservation microfilming. Beginning in 1938, the graph will show a steady rise to the late 1940s, then a small dip in the 1950s. The line turns sharply back upward through the fifties and sixties, then declines again in the

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Paper (with minor editorial revisions) presented at the RTSD Preservation Microfilming Committee program, "Cooperation in Preservation Microfilming—Past, Present, and Future," on June 25, 1984, by Nancy E. Gwinn, Assistant Director for Collections Management, Smithsonian Institution Libraries.

early 1970s. By the end of that decade, it is again clearly on an upward slant.

THE YEARS FROM 1930 TO 1940

Nineteen thirty-eight was a tumultuous year on the world scene; the Germans annexed Austria, and war suddenly loomed. A *much* less well known fact is that microfilming began in earnest in the U.S. that same year—and so did cooperative filming projects. Harvard, LC, and the New York Public Library all established photoduplication services, and all began photographing newspapers. Four patterns of cooperation emerged, patterns that exist to this day. The first is fiscal. LC worked with the publishers of the *Washington Post* and *Evening Star* to film early back files; in the case of the *Star,* LC, the publisher, and the District of Columbia Public Library agreed to share the funding up front. Second, the New York Public Library filmed the *Freedman's Journal,* the first black newspaper in America, with portions contributed by Cornell, Boston Public, and LC—an example of cooperation by contributing materials to complete a run. Harvard initiated the third type—cooperation by agreement to purchase or subscribe—when it began foreign-newspaper filming using seed money from the Rockefeller Foundation and the Harvard Corporation. By selling copies to others and putting the proceeds into a revolving fund, Harvard continued to finance its operation for 17½ years.[1] And finally, there is the "traveling camera" concept. The Mormon church began its extensive filming of archives and records both in the U.S. and abroad, a process alive and well today. Less well known was filming undertaken as part of the Historical Records Survey. The central survey office supplied the camera and labor, while the state offices or sponsoring institutions supplied raw negative film and processing. Unfortunately, not much of what the survey filmed survives.[2]

World War II gave impetus to the great foreign acquisition projects cosponsored by LC and many scholarly organizations, whose representatives helped identify the materials to be filmed. Preservation was certainly an important element, but equal to it, and soon to surpass it in importance, was the desire to acquire copies of unique materials, such as archives, manuscripts, and rare books, and make them more accessible in the U.S.

The five-year-old British Manuscripts Project provides a good example of perseverance under difficult conditions. Those who worry about the hazards of improper storage of microfilm can at least be grateful that they no longer face more serious problems: in a perfect understatement, LC reported in 1941 that "although the period was one of active submarine warfare, . . . the losses to the Project from this hazard were small."[3]

In the latter part of the decade, LC-coordinated cooperative acquisitions projects spread beyond the European theater to Japan and Mexico. This pattern was also useful at home. In 1941, LC joined with the University of North Carolina to assemble a complete official record of the proceedings of all legislative bodies of the American colonies, territories, and states. Using another traveling camera, the project continued for almost ten years. With the American Council of Learned Societies, LC also began "assembling in the form of microfilm copies, . . . the vestiges of Negro journalism from the earliest times to 1900."[4]

In 1947, ARL entered the picture with its first committee on the subject of microfilming cooperation. The committee's concentration on nationally known, domestic newspapers resulted in the first edition of *Newspapers on Microfilm*.[5] At ARL's behest, LC immediately assumed publication of this continuing series and also established the Microfilm Clearinghouse in 1949. This appears to be the first of ARL's efforts to orchestrate a large-scale cooperative preservation activity and to devise a means of data exchange, so that everyone would know what everyone else was doing. Thirty-five years later, we are all still working on it!

In the late 1940s, the points plotted on our "activity" graph show the first downward dip. LC suspended its microfilming program in 1948, while it reconsidered its policies on participation in large-scale projects. The line turns sharply back up in 1950, when LC announced a marked expansion of its microfilming program, appointed Lester K. Born as special assistant, and sent him to Paris, after consultation with the American Historical Association, for a new round of microform acquisitions.

THE 1950S

Cooperative microfilming activities in the 1950s developed along three lines. First, LC continued to organize its foreign acquisitions projects, which required assistance from foreign governments and scholarly institutions, the U.S. State Department, and individual and commercial filmers. One of the more creative aspects was LC's use of Fulbright Fellows, who, once they received their assignments, were trained, outfitted with portable cameras, and empowered to microfilm documentary materials in a variety of foreign repositories.

Second, both ALA and ARL set up national committees to achieve national consensus on priorities. In 1953, the ALA committee published a statement of principles to guide large-scale acquisition and preservation of library materials on microfilm.[6] Interlibrary cooperation, they said, would be most usefully applied to: (1) domestic newspapers of the wood-pulp period, (2) disintegrating periodicals, and (3) out-of-print books, in that order. Possibly ALA's list was prepared with the knowledge that ARL was busy at the same time carving out a program centered on foreign newspapers.

Newspapers were definitely the category of choice. Checklists and union lists of foreign and domestic holdings began to appear; scholarly groups and other organizations with special interests in Slavic, Latin American, and Chinese materials helped determine which titles were most important and who had what portions. The cooperative newspaper filming projects that evolved from this activity acquired both stability and longevity.

One clear example is the Foreign Newspaper Microfilming Project, established by ARL in 1956 at what is now the Center for Research Libraries and still in existence today. Harvard turned its films over to the center, along with the balance of its revolving fund, while LC transferred several foreign-language, domestic newspapers. It was a subscription service, with each participant (now numbering seventy-four) paying for access to a substantial body of unique material. The same year, the New York Public Library took a unilateral initiative in its National and Local Gazette Microfilming Program, which became a bilateral agreement with LC in 1974.

THE 1960S

The line on our "cooperative activity" graph continues upward in steady motion during the sixties. Cooperative work on completing files of newspapers burgeoned, thanks to LC's commitment and expansion of its program. By 1963, LC reported that of all the foreign newspapers being filmed in the U.S., it handled almost 87 percent, although much filming of domestic papers took place elsewhere.[7] But thanks in part to William J. Barrow's experiments with book paper, combined with the educational efforts of Verner Clapp, first president of CLR, research libraries began to see that newspapers, and other journals printed on paper whose poor quality was easily detected, were not the only endangered species. CLR began to collaborate vigorously with ARL and LC to develop the tools and methods that would support what was hoped to be a nationwide, coordinated effort extending well beyond newsprint. The sixties were a busy ten years, the fruit of which included the *National Register of Microform Masters,* a survey of the *National Union Catalog* to discover the quantitative measure of the situation, a 1964 study by Gordon Williams that suggested a centralized, national preservation collection, and the Brittle Books Project at LC.[8] Much was learned, but a national, coordinated program did not emerge.

Meanwhile, back in the Midwest in 1963, the Center for Research Libraries responded favorably to a group of African area studies bibliographers, who proposed what became CAMP, for Cooperative African Microform Project. Joined eventually by three similar efforts directed to South Asian, Southeast Asian, and Latin American materials, the microform projects were all designed to acquire and maintain centralized pools of unique, hard-to-get, and in some cases expensive, materials from developing nations. The Center for Research Libraries copied the successful subscription funding pattern of the ARL newspaper project; similarly, CAMP, LAMP, SAMP, and SEAM are still in operation. These projects are cooperative on a number of levels. Participants join in both funding and selection of materials to film; arrangements to film in the field require cooperation of repositories and occasional intermediaries in the form of visiting faculty or governmental offices; and finally, the center brings together files from a variety of sources to film at home, just as LC and other libraries do.[9]

THE 1970S

The points on our graph have been maintaining an upward bend for two decades. Based on start-up projects and active national planning, the line that connects the points probably reached its zenith in the 1960s, but by 1970 began to descend.

A frustrated ARL turned back to newspapers, where it could already measure substantial progress, and worked with LC to create a national program centralized at LC with a full-time coordinator of foreign newspaper microfilming. The same year ARL published a report prepared by Warren J. Haas that tried once more to move activity beyond newsprint. As an alternative to the centralized preservation collection proposed earlier by Williams, Haas suggested "the creation of a coordinated system of collections in a national plan, each with a distinctive and specific research orientation or, in certain cases, a format orientation."[10] A "preservation consortium" was what he had in mind. Its members would agree to meet specified minimum standards for physical storage of preserved items, to set up controls governing use, and to concentrate on discrete subject areas. They would add to this a planned program of microfilming, including collective ownership of master negatives. Although for several years it appeared that this idea also would come to naught, in fact, the seeds were simply a little slow to germinate.

Our graph line could not descend too far, however, for over the thirty years that had passed, research libraries had established a foundation of important, productive, yet informal cooperative activity: mutual consultations and help in completing long serials files and filling in missing pages, standards definitions, bilateral agreements, etc. By this time several research libraries set up regular filming programs. Cards and reports flowed to the *National Register*, and LC was ever willing to search records not yet published. But except for narrowly focused projects or attention to specific titles, the possibilities for major, multi-institutional cooperative actions seemed as far away as ever. This problem was recognized in 1976, when LC held a Preservation Planning Conference, where, it was noted, "It is also clear that the research library community, as a group, working with the Library of Congress and the other national libraries, must somehow join forces not just by one cooperating with one another, but by actually meshing their respective programs very carefully."[11]

In some ways, Canada scooped the U.S. when, in 1977, the Canada Council, a funding agency of the Canadian government, established the Canadian Institute for Historical Microreproductions to identify, locate, and preserve on microfiche pre-1900 Canadiana. But there was movement in the U.S. as well.

THE 1980S

Clearly, with the advent of the 1980s, the points on our graph show a definite upward turn. This advance is due to a confluence of events, in some cases unrelated to preservation, in addition to a lot of hard work on the part of a fairly small number of library professionals. The growth of shared cataloging systems, the rising number of preservation professionals, the restructuring of libraries to create preservation departments, and the increasing attention of foundations and university administrators all play their part.

There is a new wave of cooperative preservation microfilming projects in this decade, and the following paragraphs will briefly describe four of them. Unlike many past efforts, which focused on acquisitions as much as preservation, these are true preservation projects. Their targeted materials are items in general collections, some of which may be unique, but all of which are reaching the end of their natural life span. Access is still an important feature, but more often billed as "continued access" to something that may disappear, or "increased access" to materials that would otherwise have to be locked away. The projects all focus on discrete and clearly defined classes of material, and, with one exception, have moved well beyond newsprint. They all enjoy strong, centralized, managerial coordination. And, finally, they have, in three cases, good financial backing in the form of foundation support and, in the other, a promising return to a subscription-based structure.

The U.S. Newspaper Project comes first. With antecedents in the 1970s, it came alive as a cooperative effort when the National Endowment for the Humanities (NEH) took it over in 1979. In 1982, NEH awarded grants to six institutions with national holdings of U.S. newspapers to prepare bibliographic records and enter them into the CONSER database managed by OCLC. In 1983, NEH provided eighteen more grants to states and territories to plan similar projects for local U.S. newspaper holdings. Although no monies have yet been granted for preservation, that is intended to be the final phase.

The second project, planned by the American Theological Library Association, is concerned with theological monographs published between 1860 and 1929. The association has been filming theological serials for years with subscription funds and now plans to combine preservation of both types of material under the management of a single Preservation Board. Libraries will be invited to subscribe to the monograph series, thus continuing a traditional, generally successful funding structure.

The third project, the RLG's Cooperative Preservation Microfilming Project began in 1983 after two years of planning. RLG members selected U.S. monographs published between 1876 and 1900 as a target, then further subdivided by broad subject. The RLIN system plays an important role. When a decision is made to film a title, the participant enters a record of that decision into the database; the record is upgraded when the filming is completed. The master negatives are stored centrally in an RLG-leased vault. Participants agree to adhere to mutually derived filming standards and preparation procedures. For institutions that have no ready access to the RLIN system, RLG has issued a microfiche union list of twenty-five thousand master negative and "decision" records. The project costs are shared by the participants and two funders: NEH and the Mellon Foundation.

Viewed as a model, the RLG project is already beginning to have an impact on preservation planning nationally. For one thing, LC has agreed to participate, and records for LC's own master negatives will soon find their way into the RLIN database through the MARC distribution service. For another, the fourth project has been constructed specifically to complement the RLG effort.

The American Philological Association has also been funded by NEH and Mellon to preserve on microfiche printed materials published between 1850 and 1918 in the field of classical studies. An editorial board will select items for filming, which will encompass both serials and monographs. Columbia University will undertake the filming, using materials in its own collections, but also drawing from other members of RLG. Because of Columbia's RLG connection, the project will use the RLIN database and the RLG storage facility, standards, and costing formulas. The new element is the *direct* involvement of a scholarly society.

Is a national plan slowly emerging? Are we ready for it? And what is the appropriate role for LC, which has shouldered so much of the work for so many years—to its credit and our gain? Since you may find the answers in the next two papers, I shall conclude with one further thought.

Once there was a wealthy Arabian sheikh who died and left his vast holdings to his only son. Among his treasures was a large palace containing a harem filled with the loveliest of creatures. However, months went by, and the son studiously avoided this part of the palace. His closest advisers became concerned and questioned the young man as to the reason for this behavior. "I know perfectly well what I am supposed to do," he replied. "I just don't know where to start!"

Fortunately, we no longer suffer from that malady.

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ILLINOIS COOPERATIVE CONSERVATION
PROGRAM

CONSERVATION TREATMENT SERVICES FOR RARE, UNIQUE, AND LOCAL HISTORY MATERIALS

Funded in part through the Library Services and Construction Act, Title I. Hosted by Morris Library, Southern Illinois University at Carbondale.

Background

In addition to helping libraries maintain general circulating collections, the Illinois Cooperative Conservation Program is dedicated to helping protect and preserve historic materials in Illinois libraries and historical repositories. Through its information service, workshops, consulting, and publications, ICCP provides participating institutions with the information they need to protect materials from needless deterioration. Unfortunately, many materials have reached the point where conservation treatment is needed to stabilize their condition, arrest further deterioration, or return materials to a state in which they can be enjoyed, used carefully, or exhibited properly as physical artifacts. To meet this need, ICCP has developed the capability to offer modest treatment services at-cost to participating Illinois libraries and repositories.

Arranging for Services

To arrange for conservation treatment services, libraries or historical societies should call or write ICCP to discuss needs and specific treatment projects. When an arrival date is agreed upon, materials can be delivered via United Parcel Service (UPS), U.S. Mail, the Intersystems Library Delivery Service (ILDS) or delivered in person. ICCP will provide information and packing instructions. It is of the utmost importance that materials are packed carefully to avoid damage in transit.

Condition Report and Cost Estimate

Materials accepted for treatment are examined, their condition described, treatment or treatments recommended, and costs estimated. The condition report is free and includes physical composition and structure, overall condition, specific deterioration or problems, a description of the proposed treatment, and an estimate of the time and materials cost. *The condition report and cost estimate is sent to the library or repository for approval before any treatment commences.* After approval is received, the owner institution is sent an estimated date when treatment will be completed. Black-and-white photographs are taken of the items before and after treatment.

The Treatment Facility

To provide conservation treatment services, ICCP shares the facility at Morris Library, Southern Illinois University at Carbondale. Occupying 1500 square feet on the seventh floor of the library, the conservation facility is a well-organized, efficient workshop for the treatment of library and archival materials. It contains equipment, supplies, and work space for treatment of flat paper documents, hand bookbinding, collections maintenance and repair, and protective enclosure. Most recently, the facility acquired an Ultrasonic Welder for polyester film encapsulation, one of only sixteen such machines in the world.

Every Document is a Unique Problem

Every document in need of conservation treatment is a unique problem. Each will have a different physical composition and condition and a different history of use and (quite probably) abuse. For example, conservation of a brittle historic newspaper may be fairly straightforward process, *unless* it has been previously "mended" with Scotch tape by some well-meaning person! For these reasons, it is not possible to predict the time needed for expert conservation treatment without actually carefully examining the specific item in question. Rough figures can be supplied over the phone after an item is described; however, this will only be a rough estimate. Since treatment will *not* begin before a proposed treatment and estimated cost is approved, no owner institution need fear the unexpected! The exception is custom protective enclosures for fragile or valuable rare books or historic documents, which *can* be constructed for a standard charge.

For More Information

Illinois Cooperative Conservation Program
Morris Library
Southern Illinois University at Carbondale
Carbondale, IL 62901
(618) 453-5122

Partial List of Current Treatment Capabilities

- *deacidification* (neutralization of acid paper and alkalinization to prevent further acid attack) of flat paper items such as documents, maps, or paper in books that have been disbound for treatment.
- *encapsulation* (enclosure in clear polyester film) of fragile, brittle, or heavily-used flat paper items such as manuscripts, maps, and posters.
- *polyester film books* for brittle items such as historic newspapers, county atlases, or record books—including deacidification of the paper, encapsulation of individual pages, and binding in a book format.
- *protective enclosure* of rare books, damaged books, unbound historic materials, etc., in custom-fit enclosures such as portfolios, phase boxes, and drop-spine boxes.
- *rebinding* of clothbound books whose sewing structure has deteriorated, and restoration of the cloth cover.
- *matting* of flat paper items suitable for exhibition or storage in a museum mat.
- *humidification and flattening* of documents and photographs that are tightly curled or folded.
- *mending* of tears and voids in paper documents.
- *cradles or supports* custom-made to support books that will be on exhibit.

This is a partial list. For discussion of specific preservation problems, contact the CCP staff.

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Conservation Planning in the West

by Howard P. Lowell
Project Director, Western States Materials Conservation Project

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Howard P. Lowell has extensive experience in conservation, working as a freelance consultant since 1976. Presently, he is project director of the Western States Materials Conservation Project and prior to that, he was the interim director of the New England Document Conservation Center.
Mr. Lowell's other positions have been director of the Revere, Massachusetts Public Library, education specialist at the Massachusetts Bureau Library Extension and administrative service officer at the Maine State Archives. He received his master's degree in library science from Simmons College.

Since July, 1979, the Western States Materials Conservation Project has been examining library and archives conservation needs in the western United States. The Project, sponsored by the Western Council of State Libraries Incorporated, is supported by funds from the Western Council and grants from the National Historical Publications and Records Commission. The states participating in the Project are Alaska, Arizona, California, Colorado, Idaho, Iowa, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming.

The Western States Materials Conservation Project has four objectives. They are: 1) To form a cadre of conservation advocates in the West who are committed to, and are willing to work for, conservation solutions at the local, state, regional and national levels; 2) To identify library and archives conservation needs in the West, and the feasibility for a variety of actions to meet these needs; 3) To develop a coordinated, cooperative plan of action to serve as the framework for addressing conservation in the West during the 1980s; and 4) To begin an implementation process for that action.

The Project staff designed a one-day, state planning meeting as the primary method for ascertaining library and archives conservation needs. At least one meeting was held in each of the participating states, except Kansas. Anyone concerned with the preservation of information or with the media on which information is recorded was invited. In many states it was the first time that a combination of librarians, archivists, manuscript curators, conservators, records managers, microfilm specialists, suppliers and local public officials came together to consider a common problem. At the 20 meetings, 454 participated.

The agenda was deceptively simple. Staff asked participants to identify existing conservation programs and resources within their state and to define their state's library archives conservation needs. Participants then were asked to suggest actions they could take to address these needs.

Although the level of awareness on a number of conservation issues seemed high, the current level of conservation programs and resources remains relatively low. For many institutions, conservation was limited to rebinding damaged volumes and using acid-free folders and boxes for storage. There seems to be little administrative support for allowing staff responsibility and budget to be an integral part of the daily operations in a library or archives. However, most participants did identify actions which they could take. These included creating a permanent, conservation advocacy group within the state; making grant applications to secure financial support for hands-on conservation training programs; providing a conservation theme for professional association meetings; strengthening archives and records management legislation; purchasing conservation supplies on a cooperative basis; and developing disaster-assistance teams.

Conservation needs identified in each state planning meeting were fairly diverse but there were three major common areas of concern. These were conservation information and education; conservation services; and research, standards and legislation. These three elements form the themes around which a coordinated conservation action plan for the West is beginning to form.

The first action taken toward developing this plan was a two and one-half day Feasibility Colloquium at Snowbird, Utah, June 8-10, 1980. Two state representatives, members of the Project's Advisory Committee, individuals from funding agencies, and other interested librarians, archivists and conservators considered approaches to providing programs and services. Ann Russell, director of the New England Document Conservation Center, served as the Colloquium keynoter, bringing her experience in regional conservation services to the Snowbird discussions.

After an intense and somewhat exhausting day of small group meetings on each theme, a program for coordinating conservation activities in the West emerged. Colloquium participants voted to form themselves into a Western Conservation Congress and adopted a three-phase plan for regional cooperation. The initial phase is establishment of a conservation clearinghouse which will serve as a "switching station" for information and provide a focus for library and archives conservation activity. Components of this clearinghouse program will include training and education offerings; development of conservation administration tools and information packets; a conservation information data base; a consulting service; an information-dissemination function; and a conservation advocacy program. One key is the need for strong advocacy groups and programs at the state and local levels which the clearinghouse would supplement through its services. A second key is to informally link programs and resource people in the West, and to link the West to other regional and national efforts.

The second phase of the action plan calls for creating a more sophisticated package of services to supplement activities of the clearinghouse. These services might include a master microfilm depository, an insurance pool and cooperative purchases of specialized equipment. A third phase of the plan calls for creating a network of conservation laboratories in the West.

The success of any action plan is its implementation. The Western Conservation Congress has charged the Project's Advisory Committee with the initial responsibility for starting the activity of the clearinghouse. Included in this charge are developing a draft of a national, public policy statement on conservation of documentary resources; working with appropriate organizations to promulgate uniform standards for a number of conservation issues; and facilitating state-of-the-art studies on research in conservation problem areas.

With the decisions reached by the Western Conservation Congress at Snowbird, coordinated conservation activities in the western United States have begun. Also, a potential structure for cooperatively addressing some of the shared library and archives conservation needs has been provided. The real challenges still lie ahead, however. The work of the past 15 months must not become just another report deteriorating on a library shelf.

Midwest Cooperative Conservation Program

- INFORMATION
- TRAINING
- SERVICE

In the preservation and conservation of research collections

Funded in part by the National Endowment for the Humanities an
Morris Library, Southern Illinois University at Carbondale

Purpose

The Midwest Cooperative Conservation Program is part of a nationwide effort to preserve research and historical collections in libraries and archives. MCCP stimulates the development of preservation programs within participating institutions by providing real assistance in the determination of preservation needs, priorities, and goals. MCCP links participating institutions with preservation expertise by providing information, by offering training in basic conservation techniques, by consulting on the administrative and physical organization of preservation and conservation activities, and by offering conservation services and referrals.

Services

MCCP offers information, consulting, training, education, and conservation services and referrals. The long term development of a midwest program will follow a phased plan with services evolving in direct response to the needs of participating institutions.

Information

Inquiry Service: Participating institutions can call or write for quick assistance with specific preservation or conservation questions.

- *What supplies and techniques are best for mending tears in paper?*
- *How do you remove mold from videotape?*
- *What preservation concerns should be included in a library binding contract?*
- *Is there a building consultant who specializes in the design of HVAC systems for the preservation needs of research collections?*
- *A steam pipe leak has just soaked an entire floor of our library. Help!*

To research queries, MCCP staff uses and builds upon Morris Library's conservation reference collection, which includes journals, books, articles, catalogs, and manufacturers' samples. When appropriate, replies include packets of materials pertinent to the query, samples, unpublished materials, articles, and bibliographies. When necessary, other conservation experts are consulted.

Information and Training Materials: Many materials now exist to assist institutions in preservation program activities. MCCP coordinates with other state and national programs to share resources and products such as information sheets, audio-visual presentations, and current news. When appropriate, MCCP develops materials to meet a specific need and makes them widely available.

Audio-visual Loan Service includes slide-tape and videotape programs for building staff awareness and knowledge. Programs are available for short term use, and are accompanied by scripts, information sheets, and related handouts.

Focused Information Sheets are developed from topics drawn from commonly asked questions—such as how to prepare disaster coping plans or organize a conservation work station. Topics are briefly presented and accompanied by bibliographies for further study.

MCCP's Newsletter is a regular publication which gathers news of current happenings in the field; describes news of MCCP regional activities; and provides information on techniques and procedures, current technology, and availability of supplies and equipment. It also contains book reviews and features on the preservation and conservation activities of participating institutions.

Posters available for sale effectively illustrate conservation concerns, and help educate staff and patrons in the proper care and handling of research materials.

Consultations

MCCP staff are available to consult on-site and survey conditions such as disaster preparedness, environmental control and collection maintenance. A slide lecture for the staff or demonstrations of simple conservation techniques can be combined with the visit. A formal consultant's report with recommendations follows the visit. The emphasis is on what is practical and feasible, helping institutions to determine local priorities and set realistic goals.

Training and Continuing Education

Individual Training Sessions in Conservation Techniques: Participating institutions can arrange for one to two week training sessions for appropriate staff. In these sessions trainees receive intensive one-on-one instruction in basic conservation procedures and practice in making informed decisions on rebinding and repairs. These basic procedures are essential conservation activities for all research collections. Training focuses on the needs of the participating institutions and the skills and responsibilities of the trainee. In contrast to a workshop or demonstration experience, an individual training session permits more in-depth training, and the refinement of skills through repetition. It also allows the trainee to see an established facility with efficient operations. Such experience can be critically important to actual implementation of learned procedures. Sessions are conducted in the conservation facility of Morris Library.

Workshops: To provide a useful experience for as many institutions as possible, MCCP holds workshops with a practical and specific orientation to increase awareness and knowledge of preservation principles and show how these operate to protect research collections. Workshops outline a practical preservation program and demonstrate simple conservation procedures which can be performed in-house safely and quickly.

Conservation Services

Protective Enclosure Service: MCCP technical staff are available to construct custom protective enclosures including drop-spine boxes, phase boxes, and portfolios. Enclosures are priced on a strictly cost-recovery basis. Although these conservation procedures do not require the skills of a fully trained conservator, they are best performed in a conservation facility where cooperation gives participating institutions the efficiency and economic advantages of production work. A Protective Enclosure Kit is available for loan to participating institutions and includes tools and instructions for accurately measuring the dimensions of items to be enclosed, order forms, and samples of enclosures and materials. If desired, measurements for boxes and consultations for special designs can be made in conjunction with a consultant visit or as part of a special visit for that purpose.

Referrals: Referrals to established conservation treatment centers or to private conservators are made for rare and valuable items requiring extensive treatment.

Overview

Comprehensive preservation programs in research institutions are based on several premises. Primarily, such programs preserve our cultural and intellectual heritage. More practically, it makes good economic sense to insure that materials—expensive to select, acquire, and make accessible—remain in usable condition for as long as they are needed. Fortunately, the preservation and conservation field has developed a philosophy and a body of standardized procedures and technologies applicable to large collections. Such developments make the planned and coordinated preservation of whole collections not only possible, but less costly.

Ongoing research and development in the areas of mass deacidification, optical disk technology, coordinated microfilming projects, and bibliographic networking provide a basis for the solution to the loss of research materials through the embrittlement of paper. Increasing knowledge and awareness about commercial binding, contemporary book manufacture, and alkaline paper production are helping librarians and archivists select and preserve their collections through written specifications, development of standards, and cooperation to achieve consumer pressure. The application of space technologies, such as vaccum chamber freeze drying of water soaked materials, are making successful recovery from disasters a reality. Techniques and materials for the conservation treatment of rare and valuable artifacts are continuously being developed and perfected. These sophisticated procedures are being applied in a growing number of conservation facilities across the nation. Education and training in preservation and conservation principles and procedures now exist in a variety of forms, from formal university programs to brief workshops and self-teaching materials.

MCCP helps participating institutions take full advantage of these and other developments in the field of preservation and conservation.

Participation

Initially, participating research libraries and archives in the multi-state region receive program publications and have free access to information services and audio-visual training materials. These institutions may also arrange for workshops, training sessions, and on-site consultant visits for a nominal fee. Participating institutions have access to conservation services as these are developed, beginning with custom protective enclosures. Institutions outside the MCCP region will have access to program services as time permits.

MCCP is a cooperative, regional project supported in part by the National Endowment for the Humanities and Morris Library, Southern Illinois University at Carbondale.

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THE NATIONAL ENDOWMENT
FOR THE HUMANITIES

A SELECTIVE PROGRAM TO SAVE

Office of Preservation

THIS program offers support for projects designed to preserve and guarantee access to the many resources important to the study of our cultural and intellectual heritage. These are books, journals, manuscripts, newspapers, documents, maps, drawings, film, and tapes; and they are found in libraries, museums, historical societies, and other repositories dedicated to scholarship in the humanities. Awards support such activities as microfilming, training personnel, improving collection maintenance, and increasing public understanding of the preservation problem.

The Office of Preservation also administers the U.S. Newspaper Program in which projects are organized on a state-by-state basis. So far twenty-six states and territories and ten major repositories have been involved in this national endeavor to locate, catalogue, and preserve newspapers published in this country since 1690. The program enjoys the active cooperation of the Library of Congress and the Online Computer Library Center (OCLC).

Need for Selectivity

The most ambitious current plan for saving the embrittled 76 million volumes in the nation's research libraries calls for a twenty-year effort and a total cost of $300 million. The result would be the saving of 3 million titles. This illustrates two fundamental facts about preservation: that it is expensive and that it demands rigorous selection. We can save only a minor fraction of the most valuable materials.

Means and Methods

The preferred medium is microfilm in reels produced and stored in accordance with American National Standards Institute, Inc. standards. The restoration of the item (conservation) is considered worthwhile only when the original contains information of value to scholars that would be lost in reformatting.

Public Awareness

The need for preservation of this kind is not widely understood outside the library and archival professions. Widespread understanding of this issue is necessary to secure both the cooperation and support that will be needed for decades to come if we are to avoid intolerable losses. NEH staff are working closely with colleagues at the Library of Congress and the Council on Library Resources to produce a documentary film on preservation, which should be ready for viewing in the summer of 1987.

Recent Awards

- support for the nation's only formal training program for library preservation administrators (Columbia University, New York City)
- support for the preservation of ethnographic and archaeological photographs (Southwest Museum, Los Angeles)
- support for cataloguing 875 Nevada newspaper titles and more than 100 Nevada-held, out-of-state newspapers (University of Nevada, Reno)
- support for a nationwide effort to preserve embrittled books and serials in the humanities published between 1870 and 1920 by microfilming 15,000 volumes (Research Libraries Group, Stanford)
- support for the preservation of and access to the linguistic recordings and documentation of the Archives of the Languages of the World (Indiana University, Bloomington)
- support for a regional program in preservation conducted through the Southeastern Library Network, Inc. (SOLINET of Atlanta), targeted to the needs of libraries and archives in a ten-state region

Equal Opportunity

Endowment programs do not discriminate on the basis of race, color, national origin, sex, handicap, or age. For future information, write to the director, Office of Equal Opportunity, National Endowment for the Humanities, Washington, D.C. 20506.

PR87-1

◆

Priorities

1. Cooperative preservation efforts
2. Preservation of U.S. imprints and Americana, especially those most deteriorated (that is, published between 1870 and 1920).
3. Professional training

Criteria

Applications are considered competitively against these criteria:

- Importance of materials to scholarship in the humanities
- Feasibility and economy of plan of work
- Experience and ability of staff

Staff in the Office of Preservation welcome preliminary inquiries from potential applicants and will comment on draft proposals before submission against the deadlines, which are June 1 and December 1.

Office of Preservation
National Endowment for the Humanities
Room 802
1100 Pennsylvania Avenue, N.W.
Washington, D.C. 20506
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◆

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NIC

THE NATIONAL INSTITUTE FOR THE CONSERVATION OF CULTURAL PROPERTY

The cultural property of the United States - monuments, historic structures, and collections housed in public museums, libraries, archives, historic properties, and in similar private collections - requires a coordinated and permanent national effort to save it for future generations. Although attempts to establish a national effort are relatively recent, recognition of the responsibility for protecting human creations is historic. As expressed by Goethe in 1799, "*works of art are the property of mankind and ownership carries with it the obligation to preserve them.*"

HISTORY: TOWARDS A NATIONAL PLAN

Until 1973, attempts to develop a national strategy for protecting its cultural property moved slowly in the United States. In that year, a number of very concerned public and private cultural organizations formed the National Conservation Advisory Council (NCAC) to achieve three objectives: (1) to identify major national needs and problems in conservation and offer recommendations for their solutions; (2) to recommend programs that would result in a coordinated national policy and plan for the conservation of cultural property; and, (3) to consider the advisability of creating a national institute for conservation.

NCAC conducted studies focusing on major conservation concerns in a variety of disciplines. The eight resulting published reports constituted an unprecedented national resource of information. At the same time, NCAC was a test of the effectiveness of a team approach to problem-solving under interdisciplinary governance. It was an ambitious experiment, and it was a success.

In 1982, NCAC published a proposed national strategy for the conservation of cultural property in the United States. Almost simultaneously, and with the unanimous consent of its members, NCAC disbanded and created the National Institute for the Conservation of Cultural Property, Inc. (NIC).

PURPOSE

The National Institute for the Conservation of Cultural Property, Inc., a non-profit organization, was created to further the national policy for the preservation of the cultural heritage of the United States. Its three major objectives are:

- to provide for voluntary cooperation and planning among institutions, programs, and individuals in the United States concerned with conserving the nation's publicly and privately owned cultural property;

- to assist in meeting national conservation needs through information, education, and scientific support programs for conservation professionals; and,

- to enhance public understanding of conservation principles and problems, provide a center for communicating with public and private conservation efforts in the United States and abroad, and increase the level of conservation capability and its support in the United States.

GOVERNANCE AND MEMBERSHIP

The activities and programs of the NIC are supervised by a Board of Directors assisted by a Council, composed of representatives from all institutional members, that advises the Board on matters of general policy.

Membership in NIC is available through election to the Institute's Council. The Council's institutional membership is broad and provides an opportunity for every professional concerned about conservation of cultural property in the United States to be represented, either through membership in a professional organization or through association with an institution or organization. All institutions represented on the Council are voting members, with the exception of funding organizations. These organizations serve on the Council at the request of the Board of Directors as non-voting members. Generally, membership in the NIC Council is open to:

- national organizations representing conservation professionals;

- training and education programs for conservators and technicians;

- area conservation membership organizations (guilds, associations, etc.);

- institutions with conservation treatment and/or conservation research facilities for various categories of cultural property; and,

- membership organizations representing users of conservation information and services.

The Board of Directors is NIC's legal authority. It is composed of members elected by the Council or appointed by certain national professional organizations. The Council elects the Chairperson, Vice Chairperson, Treasurer, and three Members-At-Large from within its membership. The Executive Director of NIC serves as the Board's Secretary. In addition, the American Institute for Conservation of Historic and Artistic Works, the professional organization for conservators, appoints two members of the Board, one of whom represents specifically the interests of conservators in private practice; and the Association for Preservation Technology, the professional organization of historic preservationists, appoints one member of the Board.

The policies established by the Council, and as enacted by the Board of Directors, represent an effective national voice for conservation. As the Council's membership expands, opportunities for the exchange of ideas and information on conservation issues and independent conservation efforts also will expand. NIC will become an even stronger voice, and the United States will benefit from having a central, national forum for the conservation of its heritage.

FUNCTIONS

NIC has two major functions in three specific areas of concern. It's functions are to serve as a national forum for conservation in the United States and to provide information clearinghouse services. These functions are supported by NIC projects in its three specific areas of activity: education, information, and scientific research in support of conservation.

National Forum. The NIC Council provides the only national mechanism for communication and cooperation among institutions concerned with conservation in the United States. The broad representation of interests within the Council enables a dialogue among conservators, the users of conservation services, the scientific community, policy makers, and other parties having conservation interests. The Council coordinates efforts to achieve the most effective uses of human and financial resources devoted to conservation, it gathers information on which to base policy recommendations, it advises on matters concerning present and future needs in conservation and preservation, and it performs a leadership role in the formulation of conservation plans and policies. The Council focuses on the broad range of disciplines requiring conservation services and support, from the preservation of buildings to the conservation of books. Since a primary goal is to serve all disciplines, attention may be paid especially to areas where little conservation expertise is available. Through this national forum, it is possible to coordinate new programming to build on the accomplishments and activities of independent programs across the United States.

National Clearinghouse. This function is closely related to the total network of conservation resources represented by the national forum, for it permits NIC to draw on the expertise and programs of all of its members in addition to the projects it undertakes directly. The combination of these resources permits NIC, through its staff, to advise individuals and organizations on matters pertaining to conservation needs. This service ranges from simple referrals to conservation experts and facilities in different geographic areas of the country to the development of policy guides for conservation to assist public and private organizations and agencies in addressing their own conservation priorities. The information and advice disseminated by NIC is drawn heavily from the accomplishments of other programs, the results of which are shared with the Institute. When necessary, NIC undertakes information gathering projects to meet requests for information beyond what currently is available through the network of conservation programs across the country.

As it addresses national conservation priorities, the NIC Council authorizes the conduct of specific projects to meet serious conservation needs or problems. Some of these projects are a natural evolution of the Institute's purpose; others meet new and critical situations that require the attention of a national body. NIC projects are undertaken by groups of experts selected by the Board of Directors. The efforts of these groups are then coordinated and monitored by the NIC staff. Projects range from development of state-of-the-art reports on conservation disciplines needing special emphasis to development of specific technical standards in areas where urgently-needed guidance is unavailable. Most projects result in published reports, and they become an important part of the total resource of information available through NIC.

Projects are undertaken from time to time that do not result in publications; for example, NIC organizes and sponsors presentations on conservation for professionals in other related fields and for the public. This outreach is a basic and essential element of NIC's responsibility for improving awareness of the need to conserve cultural property and to provide a wider understanding of the principles of conservation. All persons who own or control cultural materials need to be educated and informed about the proper care of their important holdings. This type of project is another method by which NIC disseminates information.

As NIC grows, the number of projects that it can undertake will increase, greatly enhancing its ability to provide up-to-date conservation information and advice to the many individuals and organizations that request assistance.

SUPPORT

Support for the activities of the National Institute for Conservation and for its predecessor organization, NCAC, traditionally has resulted from grants made by public and private foundations, divided about equally between federal and private sources. Grants received by NIC support both specific projects undertaken to meet national needs and general activities required to maintain and expand the national conservation forum and the information clearinghouse.

In making the decision to implement the National Institute for Conservation, the need to significantly expand the Institute's base of financial support was well recognized. In order to provide for the Institute's long-term growth and to assure a permanent national focus on the conservation of cultural property in the United States, the Institute has initiated a comprehensive development program to assure a permanent and stable funding base for the organization.

DEVELOPMENT OBJECTIVES

There are two major objectives in NIC's general plan for obtaining financial assistance to support its primary functions and special projects. Both objectives depend on the Institute's success in creating greater understanding of conservation among potential sources of support, demonstrating the integral conservation role for every individual and organization that supports the arts, humanities, historic preservation and/or the general fields that comprise the total resource of cultural property in the United States. Since the Institute's primary role is to provide an avenue for communication among independent conservation efforts across the country, the development objective must be to increase the number and kinds of funding sources for conservation generally, whenever possible aiding local or regional conservation programs in seeking support.

The second development objective is to obtain support for the Institute's national forum and clearinghouse activities and for the specific projects that are undertaken as a part of the national conservation effort. The approach to accomplishing this is two-fold: to secure funding needed to support the Institute's programs and projects that meet pressing conservation priorities; and, to plan and develop a secure funding base for the Institute's on-going, permanent role as the voice for conservation programming across the United States.

DEVELOPMENT PLAN

NIC's development program presents unique benefits to the nation's conservation community; this effort requires the Institute to break new ground in conservation funding, introducing the nation's philanthropic sector to an important new area of cultural funding. The "behind-the-scenes" nature of conservation and the general lack of awareness of its importance in preserving almost every type of cultural property have resulted in a serious lack of financial priority for conservation programs, even among funding sources with a long history of assisting cultural programs and institutions. Therefore, the development of an expanded financial base for the Institute and for conservation generally will require a strong justification of the role of conservation in the cultural world. This educational factor in NIC's plan for phased growth is reflected in its development plan.

Development activities are directed at two goals: to raise the funds necessary to maintain the Institute's current level of activity, and to set the stage for long-range support of the Institute through a variety of support mechanisms. The first part is accomplished through careful research into the funding goals of corporations, foundations, and other funding sources to target those that have demonstrated support for the wide variety of cultural programs that depend on the conservation community to preserve their collections. The secondary effort is focused on establishing the groundwork for long-range development activities: building corporate and individual sponsorship, and maintaining a capital fund program supporting NIC's general operations and endowment.

GOALS

In addition to maintaining the existing functions of the NIC and to undertaking new projects to meet national priorities in conservation, NIC has two parallel goals: to strengthen the national forum represented by its Council members, and to increase the financial support for conservation across the United States. NIC can achieve its goals with the help of individuals, programs, corporations and foundations.

- Conservation professionals are encouraged to consider membership for their institutions in the Institute. Presently there are over sixty institutions involved in the governance of the Institute and receiving the direct benefits that this coalition provides.

- Individuals and corporations are invited to become sponsors through contributions and annual gifts.

- Public and private funding programs are urged to consider the support of conservation as a basic element of their support for cultural programs across the United States.

This publication answers a number of frequently asked questions about NIC. Additional information is available. A request form is provided for your convenience, or contact the Administrative Office of the National Institute for the Conservation of Cultural Property, Inc., A&I-2225, Smithsonian Institution, Washington, D.C. (202/357-2295).

VOTING MEMBERS OF THE NATIONAL INSTITUTE COUNCIL

Advisory Council on Historic Preservation
American Association of Museums
American Association for State and Local History
American Institute for Conservation of Historic and Artistic Works
American Institute of Architects
American Library Association
Archeology and Historic Preservation, National Park Service
Architect of the Capitol
Art Institute of Chicago
Association for Preservation Technology
Association of Art Museum Directors
Balboa Art Conservation Center
Bay Area Art Conservation Guild
Brooklyn Museum
Center for Archaeometry
Center for Conservation and Technical Studies, Fogg Art Museum
Center for the Materials of the Artist and Conservator
Chicago Area Conservation Group
Cleveland Museum of Art
College Art Association
Colonial Williamsburg Foundation
Conservation Center for Art and Historic Artifacts
Conservation Center, Institute of Fine Arts, New York University
Cultural Resources, National Park Service
Department of Conservation of Historic and Artistic Works, State University College at Buffalo
Detroit Institute of Arts
Fashion Institute of Technology
Greenfield Village and Henry Ford Museum
Intermuseum Conservation Association
J. Paul Getty Museum
Library of Congress
Los Angeles County Museum of Art
Merrimack Valley Textile Museum
Museum of Fine Arts, Boston
National Archives and Records Service
National Gallery of Art
National Trust for Historic Preservation
Newberry Library
New York State Office of Parks, Recreation and Historic Preservation, Collections Care Center
Northeast Document Conservation Center
Pacific Regional Conservation Center
Philadelphia Museum of Art
Public Buildings Service, General Services Administration

San Francisco Museum of Modern Art
Society for the Preservation of New England Antiquities
Society of American Archivists
Smithsonian Institution
University Museum, University of Pennsylvania
Upper Midwest Conservation Association
Walters Art Gallery
Washington Conservation Guild
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Williamstown Regional Art Conservation Laboratory, Inc.
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NON-VOTING MEMBERS OF THE NATIONAL INSTITUTE COUNCIL

Andrew W. Mellon Foundation
Institute of Museum Services
J. Paul Getty Trust
National Endowment for the Arts
National Endowment for the Humanities
National Historical Publications and Records Commission
National Museum Act
National Science Foundation

September, 1983

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Printed in the United States of America

Request For Additional Information

Name________________________
Program/Company _______________
Address _____________________
____
Telephone Number________________

____ CONSERVATION PROGRAMS. Please send me information about voting membership in the Institute for my program.

____ CORPORATIONS/FOUNDATIONS. Please send me more information about NIC.

____ INDIVIDUALS. I am interested in the Institute's work and would like to know more about how I may support it.

____ PUBLICATIONS. Please send me a list of the current publications available through NIC.

For additional information, please detach the card provided above, affix postage, and forward to the NIC.

No. 1 July 1985

NATIONAL
PRESERVATION
NEWS

A Newsletter of the National Preservation Program Office *The Library of Congress*

National Preservation Program Office

The National Preservation Program Office (NPPO) at the Library of Congress (LC) is now fully staffed and intensifying its efforts to provide information and assistance to the library community. The concept of an office in the Library to disseminate information about the Library's own preservation program and to contribute to a nationwide preservation effort grew out of a planning conference for a national preservation program held at the Library in December 1976.

The Library of Congress has a long history of preservation activity that has influenced nationwide preservation program development. The Library's collection of master microform negatives is the largest in the world, preserving a substantial number of deteriorated titles. Staff of the Photoduplication Service and the Preservation Microfilming Office have consistently shared their expertise and experience, playing key roles in the development of the technical standards and guidelines that govern preservation microfilming. The continuing evolution of bibliographic tools such as the *National Register of Microform Masters* and *Newspapers in Microform* have improved access to information about the existence of preservation masters nationwide.

When the Library consolidated preservation activities in 1967 and created the Preservation Office, it became a model for organizing a librarywide preservation program, designating separate offices to deal with routine binding, rare objects conservation, preservation microfilming, and scientific research. The development of sophisticated conservation procedures in the Conservation Office has greatly benefited other libraries and introduced important concepts for conserving large collections of materials with artifactual value. The Research and Testing Office plays a critical internal as well as external role, conducting basic research, initiating quality control programs, and developing

Staff of the National Preservation Program Office (from left) Merrily Smith, national preservation program specialist, Peter Sparks, director for Preservation and National Preservation Program Officer, Carolyn Morrow, national preservation program specialist, Joan Georges, secretary, and Carole Zimmermann, Preservation Office librarian.

specifications that benefit the rest of the library field. Perhaps most importantly, the Library has engaged in landmark research and development to explore technological solutions to the preservation challenge—notably in the areas of gaseous mass deacidification and optical digital disk storage.

A National Preservation Program Office within the Preservation Office enhances the Library's role in encouraging regional and national preservation efforts. Major NPPO program activities include:

Preservation Reference Service

Staff of NPPO coordinate responses to a myriad of inquiries relating to preservation and conservation. Requests for information and assistance vary from basic questions from the general public to specific inquiries from other libraries, and from colleagues in the preservation field.

Audio-Visual Loan Program

Selected A-V resources on preservation topics that have been developed by LC and other libraries are loaned free of charge to institutions and individuals. These materials are used primarily as teaching aids and to assist in staff training activities.

Pamela W. Darling concludes three years as a special consultant to the National Preservation Program Office at a tea given in her honor by William J. Welsh, Deputy Librarian of Congress.

Publications Program

The Library makes information on preservation available on a formal basis through the *Preservation Leaflet Series* and monographs such as *Bookbinding and the Conservation of Books: A Dictionary of Descriptive Terminology*. NPPO's newsletter, *National Preservation News* (beginning with this issue) highlights news of cooperative preservation projects and reports on preservation activities at LC.

Workshop, Seminar, and Lecture Program

An active continuing education and conference program involving LC staff is coordinated through NPPO.

Professional Committees

NPPO staff serve as liaisons to professional groups such as the Association of Research Libraries, the Council on Library Resources, the American Library Association, the National Institute for Conservation, the Research Libraries Group (RLG),

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National Preservation News is a publication of the National Preservation Program Office that highlights cooperative efforts to preserve our documentary heritage and reports on preservation activities at the Library of Congress. It is available free of charge to interested institutions.

The Library of Congress
National Preservation Program Office
LM G07, Washington, D.C. 20540
Telephone: (202) 287-1840
Carolyn Clark Morrow, Editor
Merrily A. Smith, Contributing Editor

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48–1984.

and the International Federation of Library Associations and Institutions. This interaction strengthens the role of the Library in national planning for preservation.

Cooperative Preservation Microfilming

Large-scale preservation microfilming activities at LC are an important contribution to an emerging national preservation program. The coordination of these activities with other libraries and organizations (notably LC's involvement in the U.S. Newspaper Program and the RLG Cooperative Preservation Microfilming Project) reflects a continuing commitment to capture and reformat deteriorated materials in order to save their intellectual content.

Intern Education Program

Advanced training through formal internships in LC's Preservation Office is available on a competitive basis in the fields of conservation, conservation science, and preservation administration.

Because LC's own programs to preserve its collections are a model for other libraries, dissemination of current information on evolving technology, policies, and procedures is important to the growth of the preservation field. The designation of full-time staff devoted to these and other outreach activities is enhancing LC's contribution to the emerging national preservation program.

CHAPTER 37 OF THE LAWS OF 1986

S. 7390--A

7. Conservation and preservation of library research materials. a. The commissioner may award an annual grant of ninety thousand dollars for a program of conservation and/or preservation of library research materials to each of the following comprehensive research libraries: Columbia university libraries, Cornell university libraries, New York state library, New York university libraries, university of Rochester libraries, Syracuse university libraries, the research libraries of the New York public library, state university of New York at Albany library, state university of New York at Binghamton library, state university of New York at Buffalo library, and state university of New York at Stony Brook library.

b. To be eligible for such grants, each such comprehensive research library must submit both a five-year plan and an annual program budget. The plan must satisfy criteria to be established by the commissioner in regulations relating to the identification of library research materials, the need for their preservation, and the means of their conservation.

c. Additional grants, the sum of which shall not exceed three hundred fifty thousand dollars in any state fiscal year, may be made to any or all of the eleven comprehensive research libraries for preservation and/or conservation of library research materials on the basis of project proposals. Approval of such proposals, and determination of funding level, shall be based upon their contribution to development of cooperative programs and/or facilities for conservation and/or preservation works in the state, including but not limited to such factors as: institutional commitment to development of a collective capacity and coordinated approach to conservation and preservation of research materials important to the people of the state; research value of materials to be preserved and/or conserved; appropriateness of conservation and preservation techniques in accordance with statewide planning and national standards; institutional capacity for successful completion of the project, including facilities, experience, and technical expertise; availability of staff with appropriate training and expertise; contribution of the institution to the project in matching funds and staff resources; and volume of interlibrary lending and access to holdings by the public.

d. Other agencies and libraries, as defined in regulations promulgated by the commissioner, which are not eligible for funding under paragraph a of this subdivision, may receive separate grants the sum of which shall not exceed five hundred thousand dollars in any state fiscal year to support the preservation and/or conservation of unique library research materials. Such agencies and libraries shall submit proposals which shall be evaluated and determinations of approval and funding shall be made on the same basis set forth in paragraph c of this subdivision.

e. Funds made available under the provisions of this section may be used by comprehensive research libraries and other agencies eligible for funding to obtain matching funds from the national endowment for the humanities preservation program.

f. The commissioner shall establish an office for coordination of conservation and/or preservation of library research materials to identify the conservation and/or preservation needs of libraries within the state, to assess the technology available for such conservation and preservation, and to coordinate the conservation and preservation efforts resulting from this legislation. The commissioner shall also establish an advisory council on conservation and preservation to assist in the development and operation of this program.

AMENDMENT TO REGULATIONS OF THE COMMISSIONER OF EDUCATION

Pursuant to Sections 207 and 273 of the Education Law.

Section 90.16 of the Regulations of the Commissioner of Education is amended, effective June 25, 1986, as follows:

90.16 Grants for conservation and/or preservation of library research materials.

(a) Definitions. As used in this section and in Education Law section 273(7):

(1) Comprehensive research library means those libraries designated in subdivision 7 of section 273 of the Education Law;

(2) Agencies and libraries, as used in Education Law Section 273(7)(d) means libraries chartered by the Regents or in institutions chartered by the Regents, other than comprehensive research libraries, and other agencies collecting, organizing, maintaining and making available to the people of the State, library research materials as defined in paragraph (6) of this subdivision.

(3) A program of conservation and/or preservation means a coordinated set of activities for the protection, care and treatment of library materials to prevent loss of their informational or intellectual content and/or of the objects themselves, including, but not limited to:

(i) collection condition evaluation and preservation planning;

(ii) environmental control;

(iii) disaster prevention, preparedness and recovery;

(iv) preparation of library research materials for storage or exhibition, including binding, matting, boxing and other protective wrapping;

(v) collection maintenance, including cleaning and refurbishing;

(vi) screening to identify items needing preservation attention, including searching to establish the availability of replacements;

(vii) rebinding, minor repair and mending;

(viii) reformatting, including photocopying, microfilming, and copying disks to tape;

(ix) major conservation treatment, such as surface cleaning, deacidification, leather repair, and conservation rebinding;

(x) creating or modifying bibliographic records to reflect preservation decisions, including reporting microform masters to the library community;

(xi) quality control and testing of materials, processes and equipment used in any conservation and/or preservation activity; and

(xii) staff training and patron awareness programs.

(4) A cooperative program means a program for the conservation and/or preservation of materials operated by a comprehensive research library for the benefit of two or more comprehensive research libraries that involves collective decision-making on priorities, avoidance of duplicative effort, use of a national data base to make known decisions on items being preserved, and the dissemination of information resulting from the program.

(5) A cooperative facility for conservation and/or preservation means a comprehensive research library which develops a capacity for serving the conservation and/or preservation needs of one or more other comprehensive research libraries beyond the immediate needs of the sponsoring institution, including, but not limited to, needs for:

(i) reformatting, including microfilming and copying disks to tape;

(ii) major conservation treatment, such as surface cleaning, deacidification, leather repair, and conservation rebinding;

(iii) the hiring of consultants to provide guidance to any or all of the comprehensive research libraries for the development of specific aspects of their conservation and/or preservation programs or for the overall development of their programs; and

(iv) training and education in conservation and/or preservation, including staff training and patron awareness programs.

(6) Library research materials means informational materials in print, nonprint, manuscript or any other format or medium which are part of the applicant's collections and are, or will be, made available for reference, onsite examination, and/or loan.

(7) Unique library research materials mean library research materials which are not accessible to the people of the State in any other collection in the State, or identifiable collections of library research materials, some portions of which may be accessible elsewhere in the State, which have research value not duplicated elsewhere in the State.

(b) Five-year plan. In order to be eligible for State aid for a program of conservation and/or preservation of library research materials pursuant to subdivision 7 of section 273 of the Education Law, each comprehensive research library shall submit a five-year plan and an annual program budget. The first five-year plan shall be submitted by March 31, 1985. Subsequent plans shall be submitted at five-year intervals.

(c) Plan. The five-year plan for a program of conservation and/or preservation of library research materials shall include, but need not be limited to, the following elements:

(1) A brief description of the types of materials in the collections and their overall physical condition;

(2) A description of the current program of conservation and/or preservation, as defined in paragraph (3) of subdivision (a) of this section, including:

(i) a brief history of program activity;

(ii) the number and type of staff involved;

(iii) the administrative organization;

(iv) current expenditures;

(v) the volume of annual activity; and

(vi) the selection criteria, technical procedures, specifications or standards used, and monitoring or evaluation processes;

(3) A description of proposed expanded, modified and/or additional activities, including five-year goals for each area of program activity and annual developmental objectives for reaching those goals covering each category set forth in paragraph (2) of this subdivision; and

(4) Evidence that local programs are designed and conducted so as to complement other conservation and/or preservation activities within and outside the State.

(d) Preservation methods. Activities in areas such as environmental control, the creation of microforms, and specifications for materials and procedures used in physical treatment shall be conducted in accordance with standards approved by the commissioner.

(e) Eligible expenditures. Activities eligible for funding shall include those listed in paragraph (a) (3) of this section, including personnel costs, service contracts, supplies and equipment, but excluding the acquisition of library research materials and building construction. Activities shall be related to annual objectives contained in the five-year plan.

(f) Applications and reports.

(1) Each comprehensive research library which has received plan approval shall submit to the department, in a form prescribed by the department, an annual application and program description for conservation and/or preservation, including budget information for the next fiscal year, and a narrative and expenditure report on program activities during the prior year.

(2) Comprehensive research libraries applying for grants under Education Law section 273(7)(c) shall submit project proposals in a form prescribed by the department, including, but not limited to, the following elements:

(i) A description of the unique library research materials to be preserved or conserved with grant funds;

(ii) A description of proposed conservation and/or preservation activities, and of the techniques to be employed in such activities;

(iii) A description of staff and/or data about suppliers of contract services which demonstrates appropriate training, experience and expertise for performing the proposed work;

(iv) Evidence of access to appropriate facilities for conservation and/or preservation;

(v) Assurance that bibliographic information in machine-readable form will be available on materials preserved;

(vi) Evidence of institutional commitment to development of a coordinated approach to conservation and preservation in the State;

(vii) Institutional contribution to the project in matching funds and staff resources; and

(viii) Provision for use of a national data base to make known to other libraries decisions on items being preserved.

(3) Agencies and libraries applying for grants under Education Law section 273 (7)(d) shall submit project proposals in a form prescribed by the department, which shall include, but need not be limited to, the elements enumerated in paragraph (2) of this subdivision and data demonstrating the volume of inter-library lending by the applicant within the State and beyond, and public access to the applicant's holdings.

(g) Advisory council. The commissioner shall appoint a five member advisory council to assist in the development and operation of the grant program for conservation and/or preservation of research library materials. Such council shall consist of one member from each of the following:

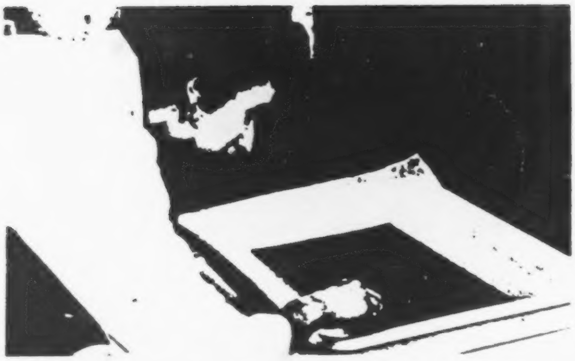
(1) a comprehensive research library;

(2) an academic library;

(3) a public library

(4) an historical society, archive, or other repository; and

(5) a person knowledgeable in conservation and/or preservation of library materials.



The Northeast Document Conservation Center

The Northeast Document Conservation Center, founded by the New England Library Board, is a non-profit, regional conservation center, specializing in conservation of library and archival material and art on paper. Its purpose is to provide the highest quality paper conservation services to institutions that do not have inhouse conservation facilities or have only limited ones. As a shared resource, it eliminates wasteful duplication of equipment and makes available on a regional basis the expertise of professional conservators.

The deterioration of collections has been a cause for increasing alarm among librarians, archivists, curators and public records administrators. The Center was established in 1973, with start-up funds from the New England Library Board and the Council on Library Resources, to help non-profit institutions safeguard collections of historical and artifactual value. The Center's Board of Directors includes the directors of state library agencies of the New England states, New York and New Jersey. The member states provide a limited amount of grant support for the Center's educational programs and disaster assistance service. The Center is now basically self-supporting, with the remainder of its income coming from fees-for-services. Each year the Center serves more than two hundred libraries, historical societies, archival institutions and town record offices. The Center has treated documents, books and works of art for such institutions as Mystic Seaport; Kennedy Library; Rhode Island Historical Society; Society for the Preservation of New England Antiquities; New Hampshire Division of Records and Archives; and Bailey/Howe Library, University of Vermont.

Disaster Assistance

A disaster assistance service has been established by the Northeast Document Conservation Center to assist libraries, archives, museums, historical societies and other repositories which may suffer damage by fire, water or other disasters.

The initial and primary concern after a disaster is the growth of microorganisms (mold, mildew, fungus, etc.). If not promptly treated, such microorganic growth may damage the materials irreparably. A well-organized and timely salvage operation will recover large quantities of valuable materials.

The Center is prepared to send staff to any location in New England, New York and New Jersey within twelve hours after a call for assistance. One or more representatives of the Center will assist local personnel in assessing damage, planning recovery procedures for handling the damaged materials, and instructing the salvage force in the proper procedures.

The first day of assistance provided by the Center is usually sufficient and is rendered as a free service to non-profit institutions. **When An Emergency Occurs: Telephone Day or Night, Seven Days A Week (617) 470-1010.**

Governing Board

Members of the Board of Directors:

Connecticut	Clarence R. Walters, State Librarian
Maine	J. Gary Nichols, State Librarian
Massachusetts	Roland Piggford, Acting Director Board of Library Commissioners
New Hampshire	Avis Duckworth, State Librarian
New Jersey	Barbara F. Weaver, State Librarian
New York	Joseph F. Schubert, State Librarian
Rhode Island	Fay Zipkowitz, Director Department of State Library Services
Vermont	Patricia E. Klinck, State Librarian

The Northeast Document Conservation Center
Abbot Hall, School Street,
Andover, Massachusetts 01810,
Telephone (617) 470-1010.
Hours: The Center is open Monday to Friday,
8:30 to 4:30. Visits are by appointment.

Services

Paper Conservation Workshop The Center's highly skilled conservation staff are well qualified to treat a great range of paper based materials. The Center is known for its treatment of books and archival materials, including manuscripts, record books, photographs, vellum artifacts, maps, and printed documents. The workshop also treats art on paper, including watercolors, drawings, prints, pastels, collages and contemporary media.

Hand Bookbindery The Center operates a hand bookbindery, specializing in a conservation approach to binding. The Center follows conservation standards using hand sewing and materials which are permanent and durable. The coordination of the bindery with the paper conservation workshop makes possible the full treatment of books, including disassembly, deacidification and mending of pages, and rebinding in a variety of styles. The Center's book Conservator advises clients about relatively low-cost alternatives for bound materials.

Microfilm Services The Center's microfilm service offers another method of preserving valuable information where restoration of the original material is not practical. Microfilm offers added security through off-site storage, minimizes the need for handling of fragile materials and facilitates the distribution of information for research purposes.

NEDCC's facilities have been designed especially for dealing with the physical and editorial problems common to archival materials, manuscript collections, newspapers, scrapbooks, photographic materials and other records of historical value. In addition to filming, the Center will process and duplicate film which has been exposed elsewhere and train planetary camera operators to do in-house preservation microfilming. Archival storage of all master negative film prepared at the Center is available at no extra cost, and of all other film for a nominal fee.

Photographic Copying Services The Center offers services for converting nitrate photographic negatives onto safety film. The service is oriented to copying large collections of nitrate negatives, glass plate negatives and other historical photographic materials. NEDCC produces copy negatives, black and white transparencies, contact prints and 35 mm slides. Photographic images can also be preserved on microfilm or fiche, which is a good method for facilitating access to large collections of historical materials.

Consulting Services The Center performs surveys for individual institutions, including a review of storage conditions and an evaluation of treatment needs of the collections. Survey documents can be of value in planning and budgeting for conservation programs on an on-going basis. Consultation on the application of microfilm to the preservation of archival and library materials is also available.

Education Programs The Center offers numerous seminars and workshops at various locations, aimed at creating awareness of conservation needs and providing information on conservation management. Speakers from the Center's staff are available to provide programs for institutions that wish to sponsor workshops or seminars for their members or associates.

Internships In cooperation with university graduate programs in conservation, the Center provides 1 or 2 advanced internships per year for students who have completed academic coursework toward a graduate degree in conservation, and who wish to pursue a career in paper conservation. In this way, the Center plays a role in the training of future paper conservators.

Fees

Costs Charges for services are levied on an at-cost basis to non-profit institutions in the region served by the Center. The charge reflects the costs of labor, materials, and a pro-rated share of overhead expense. Others may utilize the Center's services on a cost-plus basis.

Examinations and Estimates Materials brought to the Center will be examined by a member of the Center's professional conservation staff. A written condition report will be provided along with a proposal for treatment and cost estimate. At the conclusion of treatment a report is rendered to the owner. Cost estimates for microfilming are generally provided only after an on-site inspection of the material has been performed.

Transportation Whenever possible, the owner should hand carry work to the Center. If this is not possible, items may be packed securely and shipped by First Class Registered Mail or air freight. Material is insured while in transit and on our premises under the Center's fine arts insurance policy.

People

The Center has an experienced and dedicated staff, numbering 20-22 in total.

Ann Russell, Director, formerly served as Assistant Director of the DeCordova Museum and previously worked at the Society for Preservation of New England Antiquities. Her undergraduate degree is from Radcliffe College and she holds a Ph.D. from Brandeis University. She is a member of the National Conservation Advisory Council.

Mary Todd Glaser, Senior Conservator, has an international reputation as a conservator of art on paper. She was trained at the graduate program in conservation at New York University. She formerly served as Chairman of the Board of Examiners for the Certification of Paper Conservators and is a member of the Board of Directors of the American Institute for Conservation.

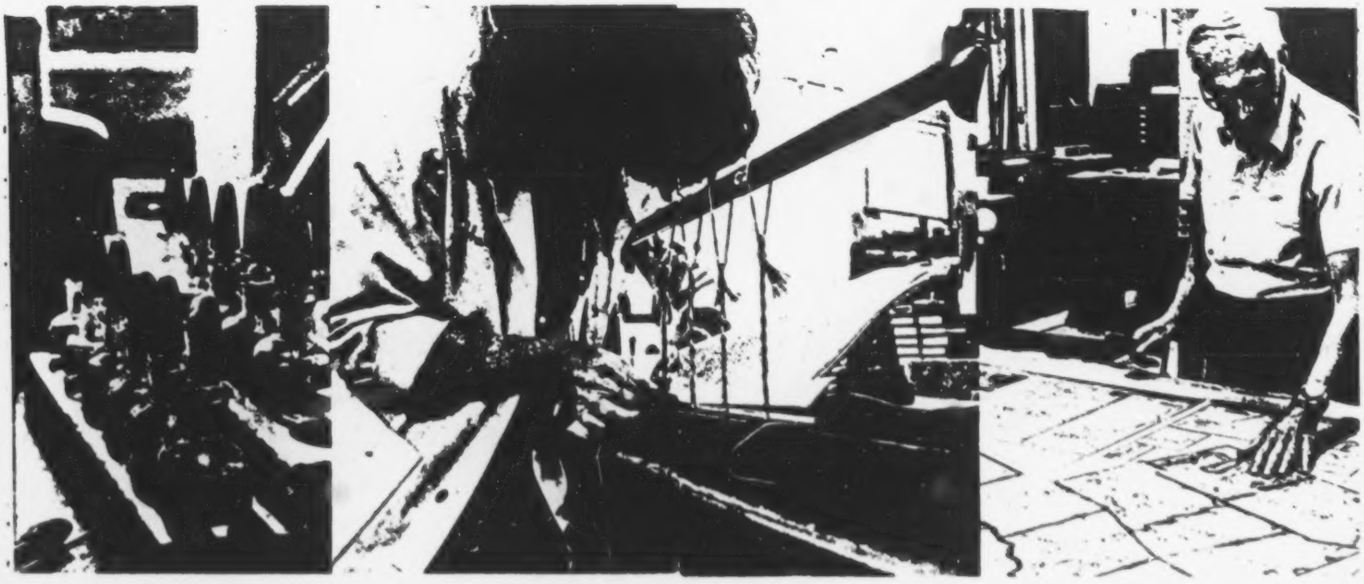
Sherelyn Ogden, Book Conservator, was trained at Newberry Library, where she worked for five years. She holds an MA from the graduate library school at University of Chicago.

Gary Albright, Assistant Conservator, is a specialist in photographic conservation. He holds a Masters Degree from the Conservation Program at University of Delaware/Winterthur and studied conservation of photographs with Jose Orraca, under an NEA grant.

Andrew P. Raymond, archivist and records specialist, directs the microfilm service. He holds an MA in history from University of Massachusetts at Amherst and teaches a graduate course in archives and manuscripts at Northeastern University.

Mildred O'Connell, Field Service Director, holds a Masters Degree in Historic Preservation from Boston University. She has had archival training and has worked with the Massachusetts Committee for Preservation of Architectural Records, surveying records held by Boston architectural firms.

The Northeast Document Conservation Center
Abbot Hall, School Street, Andover, Massachusetts
Telephone (617) 470-1010



PRESERVATION:
TAKING CARE OF
OHIO'S LIBRARIES

Ohio Cooperative Conservation Information Office

ESTABLISHED

1983

566

OHIO COOPERATIVE CONSERVATION INFORMATION OFFICE
Provides conservation training and awareness programs as well as information and referral in response to specific questions from librarians in all types of libraries.

OHIO CONSERVATION COMMITTEE
Fosters statewide awareness of the need to preserve our documentary cultural heritage, the problems involved and possible solutions.

OHIO LIBRARY FOUNDATION
Establishes a foundation accepting and providing funds for grants, research, publications, buildings, scholarships and other related library needs.

THE STATE LIBRARY OF OHIO
An Equal Opportunity Employer An Equal Access Agency
Meets the information needs of state government and assures access to library services and resources for all Ohio residents through a statewide program of development, coordination and services.

THE NEED to preserve the thoughts, history and accomplishments of humanity is self-evident — libraries exist! But the provision of physical space and a system for the storage and retrieval of this information alone will not assure this preservation. The physical objects themselves, selected books and periodicals, etc., must be preserved.

It is estimated that acid decay alone has rendered nearly one-third of the books in the Library of Congress too brittle for normal use. One third! In libraries everywhere, books are actually deteriorating on their shelves. But acid decay, although a great threat to our physical resources, is not the only threat. The environment in which the objects are stored, the manner in which materials are cared for and handled, and even a plan for reacting to unexpected emergencies and disasters, all contribute to the longevity or destruction of our precious resources; all must be given careful consideration by librarians. The challenge is immediate and demanding, but there are solutions.

> HERMANN HESSE
>
> OF THE many worlds which man did not receive as a gift of nature, but which he created with his own spirit, the world of books is the greatest . . . . Without words, without writing, and without books there would be no history; there could be no concept of humanity."

The Ohio Cooperative Conservation Information Office, in cooperation with the Ohio Conservation Committee, the Ohio Library Foundation and The State Library of Ohio was established in 1983. Under the direction of Becky Winkle, the OCCIO offers a variety of publications, seminars and training workshops, as well as information and assistance by telephone and referral services, all designed to assist librarians within Ohio in meeting the challenge of preserving our libraries' resources. Contact the OCCIO today: (614) 221-2064. Tomorrow may be too late.

NATIONAL
PRESERVATION
NEWS

No. 6, October 1986

A Newsletter of the National Preservation Program Office *The Library of Congress*

Preservation Initiatives in the States

New York

Legislative Initiative

In fiscal year 1984-85, the State of New York appropriated an annual $1.2 million for the preservation and conservation of library research materials. The program is administered through the Division of Library Development of the New York State Library. The appropriation was part of a total $57 million in state aid granted to libraries and represented the first state government support for preservation anywhere in the nation.

The bulk of the money, $1 million, was earmarked for support of preservation programs in the eleven major research libraries of New York (Columbia, Cornell, New York State Library, New York University, University of Rochester, Syracuse University, the Research Libraries of the New York Public Library, and the State University of New York Centers at Albany, Binghamton, Buffalo, and Stony Brook). $200,000 was set aside for discretionary grants on a competitive basis to all other libraries and other repositories holding materials of special or unique research importance. Legislation enacted in 1986 increased the annual appropriation to $2 million, with the increase including $350,000 for *cooperative* programs among the eleven major libraries and an additional $300,000 for discretionary grants. Legislation is currently being proposed to raise the total annual appropriation to $3 million.

Continuing support for preservation programs in the eleven research libraries, coupled with a forum for developing a cooperative approach, will strengthen New York's efforts to address the preservation of important research resources in the state as well as its ability to contribute to the emerging national effort. The discretionary grant program is being enhanced with a new program of preservation education and technical assistance. This outreach program will help identify important collections, assist institutions in program and proposal development, coordinate the discretionary grant program with the program for the eleven research libraries, and evaluate progress and disseminate successful elements as a model for other states. For further information contact Connie Brooks, Conservation/Preservation Program, Division of Library Development, New York State Library,

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[*] *State seals used in this issue indicate that specific legislation supporting preservation activities exists in the state.*

10-B-41 Cultural Education Center,
Albany, NY 12230. (518) 474-4969.

Statewide Planning

Concurrent with New York's impressive legislative initiative for preservation, the State Archives and State Library are concluding a three-year joint preservation planning and advocacy project funded in part by the National Endowment for the Humanities (*National Preservation News*, April 1986).

Our Memory at Risk: Preserving New York's Unique Research Resources was drafted during the three-year project, discussed at a statewide conference in May 1986, and modified based on input from conference participants and others. The final version will be published in early 1987. The report includes recommendations for statewide preservation activity, with the goal of insuring the survival of information of enduring value to the citizens of the state. Guided during the planning process by the ad hoc New York Document Conservation Advisory Council, the project's recommendations for action are addressed on multiple levels. Significantly, individual citizens, associations, and institutions are urged to take *independent action* to address the preservation problem; this is a crucial aspect of the program, emphasizing the value of grass roots recognition of a problem that concerns all citizens. Recommendations for *statewide action* emphasize direction and support and include the following areas:

- identification and selection of materials
- education and training
- preservation standards and information services
- disaster preparedness and assistance
- local and statewide public awareness
- investigation of preservation service needs and options
- state financial and technical assistance
- national cooperation and support
- ongoing preservation evaluation and planning

The report is addressed to state legislators, the governor, and other state government leaders who have responsibility for preservation of research resources throughout the state. For further information, contact Christine Ward, Project Coordinator, NY Document Conservation Planning Project, New York State Archives, Cultural Education Center, Albany, NY 12230. (518) 474-5135.

National Preservation News is a publication of the National Preservation Program Office that highlights cooperative efforts to preserve our documentary heritage and reports on preservation activities at the Library of Congress. It is available free of charge to interested institutions.

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Carolyn Clark Morrow, Editor
Merrily A. Smith, Contributing Editor

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48—1984.

Maine

On April 26, 1985, 150 Maine librarians, curators, historical society members, and interested citizens participated in a conference designed to increase awareness of the need to preserve library, archival, and historic collections and provide information about preservation alternatives.

The conference was the result of a growing concern about the deterioration of historically valuable materials in the state of Maine, and was cosponsored by the Maine State Library and Bridgeport National Bindery, Inc. of Agawam, Massachusetts. While participants were very receptive to the concept of preservation, it was obvious that without sound financial support little positive action would take place.

During the conference, State Librarian J. Gary Nichols pledged his support for the development of a statewide preservation program. Working in consultation with State Library staff, the Northeast Document Conservation Center, and others, Mr. Nichols drafted a legislative document for introduction to the 112th State Legislature in January 1986.

During 1986, documentation was prepared for presentation to legislative committees and support was enlisted from libraries, historical societies, legislators, and private individuals. After careful review, the legislature voted to enact the Conservation and Preservation bill and Governor Brennan signed it into law. The bill provides an annual fund of $25,000 for conservation of materials owned by the State Library and $50,000 for matching incentive grants to be awarded to institutions for the preservation of unique research materials.

This landmark legislation is an important first step in establishing a program that will insure that valuable documentary resources of special significance to the heritage of Maine are preserved for future generations. However, much work remains to be done. A statewide assessment program must be developed to determine preservation needs, including special training requirements for individuals charged with the care and handling of unique documents. Services needed to support special preservation projects must be identified. In addition, technical information must be disseminated to assist applicants in the development of projects. For more information contact J. Gary Nichols, State Librarian, Maine State Library, Cultural Building, August, ME 04333. (207) 289-3328.

New Jersey

In 1984, the State Library of New Jersey contracted with the Northeast Document Conservation Center to conduct a study of preservation needs and develop a state plan to address them. The study was directed by Howard P. Lowell (Director of the Oklahoma Resources Branch of the Oklahoma State Library) who worked with a statewide Advisory Committee chaired by Assistant State Librarian Donna Dziedzic. *A Plan for Preservation in New Jersey Libraries: First Steps Towards a State Approach for the Preservation of Library Materials in New Jersey* identified several crucial areas of need including preservation awareness and advocacy, disaster planning and assistance, institutional plans and programs, and access to preservation and conservation services. The plan stressed that cooperation was the most cost-effective method of coping with common preservation problems and that the State Library should provide preservation leadership for the state.

Implementation of the plan began with the passage in 1985 of Senate bill 1020 creating the Library Development Aid Law which included provisions for funding preservation and conservation grant projects in New Jersey libraries. Concurrently, a Library Services and Construction Act grant was used to fund a preservation consultant position within the Library Development Bureau and, in May 1986, to hire Sally Roggia to develop a detailed implementation plan for a New Jersey statewide preservation program.

Initial work includes the establishment of an information clearinghouse, disaster recovery program, and basic preservation education program. Preservation information, training, and service programs will be developed in cooperation with the state's regional library cooperatives which form the New Jersey Library Network. Regulations and guidelines for the preservation grant program are being developed in anticipation of full funding for the Library Development Aid Law. For more information contact Sally Roggia, Preservation Consultant, Library Development Bureau, New Jersey State Library, 185 West State Street, Trenton, NJ 08625-0520.

California

In July 1986, the libraries of the nine campuses of the University of California (UC) initiated a cooperative program to preserve their library and archive collections with an initial annual appropriation of $200,000 from the State of California. Cooperative preservation efforts in FY 1986-87 are focused on disaster preparedness and response, preservation microfilming, education and training of preservation staff, and tracking of developments in mass preservation technologies.

Governance of the cooperative program is provided by a steering committee of UC library directors. Program implementation is the responsibility of an operations committee composed of preservation officers charged with managing campus preservation programs to meet the needs of the university and its nine campuses (Berkeley, Davis, Irvine, Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz).

The cooperative program also has a central staff to facilitate the work of the steering and operations committees: a director for general management and coordination of operations; a preservation librarian for education and training; and an administrative assistant. The program staff assist with the implementation of campus programs and assume primary responsibility for development, coordination, and implementation of shared preservation services. Inquiries about the program may be addressed to Barclay Ogden, Director, University of California Preservation Program, 416 Main Library, University of California, Berkeley, CA 94720. (415) 642-4946.

Illinois

In 1981 the Illinois Cooperative Conservation Program (ICCP) received the first of several grants to conduct a statewide preservation information and outreach program. ICCP is hosted by Southern Illinois University at Carbondale and supported by Library Services and Construction Act funds administered through the Illinois State Library. Since its inception, ICCP has served as a focal point for preservation in the state: producing technical leaflets, posters, and audiovisual training aids; consulting onsite and over the phone with individual institutions; and holding numerous workshops. A modest treatment service initiated in 1983 served to highlight the serious lack of sophisticated conservation treatment services for rare and unique materials. During the same time frame, Illinois research libraries have increased their preservation program activities. In 1985, Bridget Lamont, Director of the Illinois State Library, convened a statewide task force to review preservation activities in Illinois and develop a five-year plan for the preservation of library and archival resources. The Task Force's plan submitted in April 1986 outlined a compehensive program with its goals to: 1) cultivate public understanding of the problem and seek enabling legislation and appropriations for a coordinated preservation program; 2) establish an Office of Preservation in the Illinois State Library to implement the recommendations in the report; 3) provide information and training services through the eighteen regional library systems; 4) identify material needing preservation and set priorities for treatment; 5) create centers for conservation training and treatment; and 6) assess the need for mass deacidification facilities.

Currently, the Secretary of State (who

serves as the Illinois State Librarian) has committed funds to establish an Office of Preservation with a permanent Advisory Committee. For more information contact Amy Keller-Strauss, Library Development, Room 288, Illinois State Library, Centennial Building, Springfield, IL 62756.

Ohio

Statewide preservation initiatives are present in Ohio through the Ohio Conservation Committee (OCC) (established in 1984 as a coalition of librarians, archivists, and others concerned with the preservation of documentary resources) and with the Ohio Cooperative Conservation Information Office (OCCIO) (a project funded since 1983 through the Library Services and Construction Act). OCCIO has operated an information clearinghouse and sponsored numerous workshops around the state, while OCC has worked to articulate preservation concerns and forge cooperative links between existing preservation programs.

Currently, OCC is working through two active subcommittees. The Subcommittee on Mass Deacidification has prepared "The Acidic Book: A Crisis in Ohio Libraries" for consideration by the Inter-University Library Council, a body representing libraries at Ohio's thirteen state-supported universities, and by the Library Study Committee, a high level advisory body responsible for study and recommendation of new library facilities to the Ohio Board of Regents. OCC vigorously supports the concept of developing a mass deacidification facility in Ohio to begin to address the state's *prospective* preservation problem.

The recently established Subcommittee on Preservation Microfilming is conducting a survey of microfilming capabilities as a preliminary to preparing a report with recommendations. For further information contact OCC Chair Wesley Boomgaarden, Preservation Officer, Ohio State University Libraries, 1858 Neil Avenue Mall, Columbus, OH 43210.

Wisconsin

In September 1986, the University of Wisconsin–Madison convened a statewide conference to address the preservation of Wisconsin's library and historical resources and consider a draft proposal for a statewide preservation program. The two-day conference was attended by directors and key staff of academic and research libraries, archives, and historical repositories; college and university administrators; and representatives of professional organizations and of the paper and printing industries in Wisconsin.

The draft plan for a Wisconsin preservation program was developed by an ad hoc Preservation Planning Group with representatives from the library, archives, and historical communities. The plan's central premise was that libraries and archives in Wisconsin cannot *independently* fund and maintain the facilities and staff needed to conserve their collections in a comprehensive and systematic manner.

The initial draft plan proposed that a central preservation program be developed and administered through the General Library System of the University of Wisconsin–Madison, and made available to all academic and public libraries and archives on a cost-recovery basis. Program components suggested included education and training, consulting, administration of a preservation "last copy" program for the state, development of microfilming and conservation treatment facilities, and institution of a discretionary grant program to encourage preservation of unique research collections.

Following the statewide conference, the ad hoc Preservation Planning group met to modify the program plan in light of suggestions and concerns raised by the conference participants. Currently, the proposed plan places responsibility for *planning and coordination* of a statewide preservation initiative with the Council of Wisconsin Libraries (COWL). COWL is a cooperative body that, among other activities, operates Wisconsin Interlibrary Services (WILS), an organization for statewide interlibrary loans, and serves as the contracting agent for OCLC services in Wisconsin.

A cooperative preservation program would also build upon the preservation programs already in place in Madison at the university library and the State Historical Society, and other programs emerging or planned in Wisconsin. In addition, the University of Wisconsin Foundation has offered to assist in finding significant endowment funds to launch the program. For further information contact Louis A. Pitschmann, Associate Director for Collection Development and Preservation, University Libraries, University of Wisconsin–Madison, Memorial Library, 728 State Street, Madison, WI 53706.

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RLG AND THE PRESERVATION PROGRAM

THE RESEARCH LIBRARIES GROUP

The Research Libraries Group, Inc. (RLG) is a corporation owned by a number of the nation's major universities and other research institutions. RLG is dedicated to improving the management of information resources necessary for the advancement of scholarship. Its goals are:

- to provide research institutions a structure through which common problems can be addressed;
- to provide scholars and others with increasingly sophisticated access to bibliographic and other forms of information;
- to enable libraries to manage their catalogs in an automated mode and in the context of an automated union file of all member collections; and
- to promote, develop, and operate cooperative programs in collection development, preservation of library materials, and shared access to research materials.

RLG is founded on the recognition that neither significant increases in library purchasing power nor reductions in demand for library services are likely in the foreseeable future; that the volume of information on which modern scholarship depends will continue to grow; and that in the decades ahead individual collections, regardless of their size and history, will be forced to move increasingly away from comprehensive acquisitions policies.

The creation of RLG is an effort by research universities and independent research libraries to manage the transition from locally self-sufficient and independently comprehensive collections to a nationwide system of interdependencies that will preserve and enhance our national capacity for research in all fields of knowledge and improve our ability to locate and retrieve relevant imformation.

THE PARTNERSHIP CONCEPT

The RLG partnership concept is best expressed in an excerpt from a December 11, 1981 resolution of RLG's Board of Governors.

> "As it exists today, RLG is, above all other characteristics, a reflection of a series of interinstitutional agreements among the members. The substance of its programs in shared resources, collection management and development, and preservation, is contained in policies and procedures approved by the members and affecting the operating environment of each member. RLIN [the Research Libraries Information Network], the integrated technical service system, also reflects, in essence, treaties among the members to share the costs of supporting portions of their operations, e.g., cataloging and acquisitions processes.
>
> "The reality of interinstitutional agreements makes RLG a true program-based partnership among the members. As they have evolved this effort, the partners have developed a series of theorems for continuing success.
>
> "First, that the partnership must be institution-based because its success must involve the academic program planning process as well as the library planning process;
>
> "second, that the partnership must evolve on the basis of mutual benefit; that is, that there is a recognition of the requirement for balance between what an individual partner gives to and receives from the partnership;
>
> "third, that the partners acknowledge the requirement for some of their interinstitutional agreements, once entered into, to be binding on them in order to allow academic and library planning at member institutions to be based on those agreements;
>
> "fourth, that the partners retain effective control over the partnership; that is, that the partnership not attain a 'life of its own,' or, as it is often expressed, 'survive for the sake of survival.'"

Thus, the sharing of responsibility in this partnership is based in member institutions, cemented by binding agreements, and controlled by members so that mutual benefits result.

THE PRESERVATION PROGRAM

The collections of our nation's research libraries contain the records and documents that mark the progress of intellectual history and form the backbone of scholarly research. Collectively the members of the Research Libraries Group house over 70 million volumes, 980,000 serials, 37,000,000 microforms, and an increasing number of films, maps, sound recordings, scores, computer tapes, and other nonprint materials. Although inanimate, these objects can be thought of as mortal, with a lifespan dependent on the stability of the materials of which they are composed and the care with which they are handled and stored.

As has become painfully obvious in recent years, the continued existence of large portions of research collections is in jeopardy. Paper-based items, especially those produced within the past one hundred years, are particularly threatened because of the high acid content of most paper. Buildings with inadequate environmental controls, increasing air pollution, changes in book production techniques, and frequent use have also combined to accelerate deterioration. A number of alarming estimates of the size of the problem have been published, and recent statistical samplings by RLG members lend them credence. For example, Yale University tested 30,000 of Sterling Library's 4,000,000 volumes and found that 46 percent were already so brittle that one or two double folds would break the pages. One more use of such a volume might well be its last. The University of Michigan has concluded that half of its Western European literature collection is brittle, while Brigham Young University estimates that over 100,000 volumes in Lee Library are in a similarly deteriorated condition. More than 25 percent of Stanford's humanities and social sciences collections show advanced signs of brittleness.

RLG members view the challenges presented by this retrospective problem, and the requirement to maintain in good condition items currently acquired, as one of their principal targets for cooperative effort. The interdependencies established through the evolution of the Research Libraries Information Network (RLIN) data base, the distribution of primary collecting responsibilities, and improved interlibrary loan and access policies are only useful if the collections themselves continue to be available.

RLG I

Much of the present RLG Preservation Program draws on planning and analysis performed by the first RLG Preservation Committee, composed of representatives of the first four members of RLG: The New York Public Library and Columbia, Yale, and Harvard universities. The group adopted a microfilm pricing policy, developed plans for a cooperative filming program focused on serials and multivolume sets, drew up a host of formal procedures and forms to ensure communication among the members, and articulated a long-range preservation plan. In addition, the group undertook lengthy investigations of the possibilities of joint contracts with commercial filmers and joint storage of master negatives. In 1977, RLG set aside $60,000 to be divided evenly among the four members and used for preservation microfilming. Each member was individually responsible for the preparation, bibliographic work, selection of filmer, quality control, storage, and service of items selected for filming; the RLG funds supported filming costs only. At the conclusion of the effort, 61 multivolume titles -- over 120,000 pages -- had been filmed. When Harvard withdrew from membership, its films were transferred to Yale for storage and service. A list of the titles filmed under this program appears in Appendix B.

In 1980, after RLG adopted the Stanford computerized bibliographic system and moved its headquarters, the Preservation Committee was reconstituted and began work afresh. Appendix A contains the names and addresses of current committee members.

Program Goals

Through the RLG Preservation Program, members are seeking the most appropriate ways to divide and share the responsibility for preservation in order to make the most effective use of their aggregate human and fiscal resources. The goals of the program, which are mirrored in the formal charge to the Preservation Committee, are:

- to develop a plan for sharing preservation responsibilities and thus to ensure continuing availability of research resources in all appropriate fields;

- to develop a means to exchange information regularly about items preserved at member institutions;

- to define policy issues governing preservation responsibilities of RLG members that correspond to their collecting responsibilities;

- to outline systems development work required to use RLIN effectively for preservation purposes, e.g., information about preservation decisions, management reports, etc.;

- to evaluate available technologies related to preservation to determine RLG's potential role as a site for pilot projects, testing, or experimentation;

- to identify special data bases or retrospective conversion projects that would expand coverage of information within RLIN and assist in supporting rational cooperative preservation policies.

Underlying these objectives is the growing realization that the scale of preservation needs of most major research libraries is vast and there are no inexpensive technological solutions. It is assumed that no single institution will be able to mount a program comprehensive enough to rehabilitate its entire collection. To ensure the wisest application of limited funds, the requirement for cooperation is clear. However, RLG members do not assume that, even as a group, they alone can meet the preservation needs of the scholarly community. Rather, they hope to develop model programs and establish a structure that could be extended to and coordinated with the efforts of a variety of organizations and institutions.

Program Components

The initial focus of the RLG Preservation Program has been on the use of microform technology as a means of capturing the intellectual content of paper publications that have no artifactual or intrinsic value as objects. Three projects have been established in this area.

1. Enhancements to RLIN

In October, 1982, and March, 1983 several new features were added to the RLIN system to improve communication about microforms. These are explained in full in other sections of this manual. Funds from The New York Public Library supported the system development work required.

2. Bibliographic Control of Microform Master Negatives

In September, 1982, RLG received a grant from the National Endowment for the Humanities to improve accessibility of information about member-owned microform master negatives. Eleven RLG members are entering records for their master negative collections into the RLIN data base. By the end of the project, scheduled for January 31, 1984, approximately 21,000 records will have been added. This project complements a similar effort by The New York Public Library to add its master negative holdings to RLIN, a project funded by the Andrew W. Mellon Foundation. Records for newly produced master negatives are entered into RLIN regularly. A union list, containing all retrospective and current records entered into RLIN since October 1981, will be produced for distribution outside the partnership. Members also report their holdings to the National Register of Microform Masters at the Library of Congress.

Participants in the project are:

American Antiquarian Society
Columbia University
Cornell University
New York University
Princeton University
Rutgers University
Stanford University
Temple University
University of California, Berkeley
University of Michigan
Yale University

Having the records for RLG collections of master negatives will facilitate preservation-related searching and local decision making. It will also provide a strong foundation for other cooperative preservation microfilming activities.

3. Cooperative Preservation Microfilming Project

Another major component of the RLG Preservation Program is a cooperative preservation microfilming project, focused on retrospective collection strengths at member institutions. RLG members plan to develop a series of carefully defined targets for preservation attention, using microfilming technology until a new technology, such as optical disc, can be successfully and less expensively applied. This project is described more fully in a following section.

RLG Microform Pricing Policy

To encourage support of preservation microfilming activities in RLG member libraries, on December 10, 1981, the RLG Board of Governors approved the following policy, which was based on recommendations of the RLG Preservation Committee.

1. Charges to users for microform copies of whole items shall be based on the principle of at least full cost recovery.

2. If revenue is collected in excess of cost, it shall be used, as far as possible, for additional preservation filming activity.

3. Libraries shall keep master negatives of whole items made in response to user requests.

4. Libraries should enter a bibliographic record in RLIN for each created microform (or revise an existing record) as expeditiously as possible, so that duplicative filming efforts are avoided.

PRESERVATION AND COLLECTION DEVELOPMENT

Just as the distribution of responsibility for collecting and sharing resources depends on the preservation of those resources, so the projects outlined here illustrate the dependency of a successful preservation function on other library processes. The efforts of catalogers are required to ensure bibliographic control, so that information about what is preserved can be shared; collection development personnel are needed to select wisely among competing preservation needs; and interlibrary loan staff must give attention to minimizing potential harm to items in transit. In particular, preservation is an extension of collection development and must be carefully considered as such within each member institution.

One of the major activities of the Collection Management and Development Program is the evaluation of existing collection strengths and current collecting intensities. A data base, called the RLG Conspectus On-line, has been constructed and provides a tool for distributing collecting responsibilities. The same information has the potential for distributing preservation or cataloging responsibilities. If these activities proceed independently, the potential for conflicting priorities within member institutions is high. RLG is seeking ways to ensure that its cooperative programs are in harmony, each contributing to the health of the others.

SOLINET

Southeastern Library Network, Inc.
Plaza Level, 400 Colony Square
1201 Peachtree Street, N.E.
Atlanta, Georgia 30361
Telephone (404) 892-0943

THE SOLINET PRESERVATION PROGRAM -- Service Overview

The SOLINET Preservation Program was established in January 1985 to address the preservation needs of libraries, archives, and other repositories in the Southeast. As many studies have noted, our documentary resources are deteriorating at an alarming rate, thus eroding the records of civilization. Preservation seeks to combat that deterioration, with the goal of extending for as long as possible (or for as long as needed) the useful life of these records. Preservation activities include: the maintenance of appropriate environmental conditions; improvement of practices for storage, handling, exhibition, and security; staff and user education; emergency/disaster planning and recovery techniques; and remedial treatment of individual items through minor repair, rebinding, reformatting, and full restoration.

The SOLINET Preservation Program is designed to help repositories plan, implement, and improve preservation activities at the local level and through cooperative efforts. SOLINET's preservation services focus on the provision of education and field services. Each is described below.

Information & Resource Center — The SOLINET Preservation Office gathers materials and information that can be shared with repositories in the Southeast. This information includes the following.

-- Audio-Visual Loan Service: SOLINET loans slide-tape programs to institutions for use in staff and user education. Contact the Office for specific information.
-- Preservation Leaflet Series: information leaflets, bibliographies, and other materials provided to subscribers at no charge
— Preservation Reference Service: Individuals may contact SOLINET with any kind of preservation question and receive a written or oral response to questions in preservation-related areas, such as environmental standards and guidelines, sources of services and supplies, reading lists, procedures, and technical information.
— referrals to conservators and other specialists
— information about other preservation activities, resources, and technical developments

Educational & Training Programs — To promote preservation awareness and expertise, SOLINET offers a variety of programs.

— general speaking engagements, usually as part of other meetings
-- seminars and workshops, on topics such as preservation planning, commercial binding, minor repair, and disaster planning and recovery

Some of these are planned and sponsored by SOLINET alone; others are held at the request of a library or archival association.

(O V E R)

Consultation Services — The SOLINET Preservation Program provides on-site surveys for individual institutions. These include assessments in the following areas: physical plant, environmental conditions, collection maintenance practices (e.g., storage and handling), collection condition, and disaster preparedness. The consultant provides a written report of findings and recommendations, which the institution may use in programmatic or financial planning. The service is available by application, and application instructions are available from the Preservation Office. SOLINET offers other consultative services tailored to the needs of individual institutions or groups of institutions; contact the Office for additional information.

Disaster Assistance -- SOLINET offers information to aid institutions in disaster planning and prevention, and provides assistance by phone to institutions that have suffered an emergency or disaster in their collections. In addition, the Office provides guidance and support in the formation of cooperative disaster planning and recovery efforts among groups in the region.

Questions and Answers

Q: Who is eligible to use SOLINET's preservation services?
A: Any non-profit organization in the ten Southeastern states (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia), regardless of whether or not the organization holds membership in SOLINET.

Q: Would SOLINET conduct a special workshop for my organization?
A: SOLINET welcomes the opportunity to conduct programs in conjunction with local and statewide meetings. The planning and implementation can be done by SOLINET alone or in cooperation with the sponsoring organization. Call SOLINET as early as possible in the planning process to determine staff availability and to discuss possible topics and dates.

Q: What do these services cost?
A: Most of the information services are free of charge; some publications will have a small fee. When asked to speak or lead a training program, SOLINET usually asks for reimbursement of travel expense. Workshops are conducted on a cost-recovery basis, so registration fees vary. Consultative services require travel expense plus an honorarium. Disaster advice given by phone will be free of charge.

Q: How can I receive further information and announcements about the SOLINET Preservation Program activities?
A: Contact Lisa Fox, SOLINET Preservation Program Coordinator, at the address provided on the front of this sheet.

The SOLINET Preservation Program is funded in part by a grant
from the National Endowment for the Humanities.

— March 27, 1986

Section 9: Preservation Supplies

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NOTE: This list is being revised and updated. For further information please contact
Frank Yezer at (512) 471-9117.

THE HARRY RANSOM HUMANITIES RESEARCH CENTER

CONSERVATION DEPARTMENT

Supplies & Suppliers

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2 Archival Storage Containers and Materials
3 Box and Phase Box Making Materials, Tools and Equipment
5 Chemicals
7 Furniture and Equipment
10 Hand Tools
13 Matting and Framing Materials and Supplies
16 Research and Testing Equipment and Supplies
19 Supplies
22 Suppliers

A few of the suppliers on this list are national and international distributors. Many are specific to the Southwest and some are Austin businesses only. Where the word "local" appears in the suppliers column, the HRHRC uses one or more local suppliers. The products purchased from these local suppliers are fairly common articles which can be found in any city.

ARCHIVAL STORAGE CONTAINERS AND MATERIALS

Apothecary bottles with stoppers	S & W
Bags, zip-lip	Cole Parmer, Univ Products, Cons Matls
Beakers -- Pyrex	Sargent-Welch, Fisher, Thomas
Boxes	
Acid-free	Hollinger, Process Matls, Cons Matls University Products
Document	Cons Resources, Hollinger, Cons Matls
Drawer liner, buffered	Conservation Resources
Print	Cons Resources, Conservation Materials
Slide	Conservation Resources
Corrugated cardboard, acid-free	Process Materials, Conservation Materials
Droppers	Fisher
Enclosures -- four-flap, buffered and unbuffered	Conservation Resources
Envelopes	
Acid-free -- Perma Dur	Univ Products, Conservation Materials
Glassine	Light Impressions, Cons Matls
Folders	
Heavy duty, map and print	Cons Resources, Cons Matls
Perma-life, Perma Dur	Univ Products, Conservation Materials
Petri dishes	Fisher, Thomas
Sleeves	
Acetate -- Kodak	Hooper, Kimac
Paper, buffered and unbuffered	Conservation Resources
Slide storage -- Franklin	Univ Products, 20th Century Plastics
Transparent	Kleer Vu, Transilwrap,
Tri-acetate	Hooper

BOX AND PHASE BOX MAKING MATERIALS
TOOLS AND EQUIPMENT

Adhesive, PVA -- Jade 403	Aabbitt-Jade Adhesives, Cons Matls
Board	Jim Walter Papers
Binders -- Davey	Gane Bros & Lane
Lig-free	Conservation Resources
Board shears -- Vagelli	Bookmakers
Bone folders	Talas
Book cloth	Holliston, Bookmakers, Talas, A/N/W
Brushes, glue	Talas, Conservation Materials
Buckram, starch-filled	Bookmakers, Talas, Holliston
Corner rounder	Hollinger
Creaser	Hollinger
Cutting mat -- Uchida	Texas Art Supply, Cons Matls
Felt	Continental Felt, London Fabrics
First Aid kit	local
Glue pot -- Nalgene	Fisher
Newsprint	local printing supply
Paint roller, foam	local
Paper -- Permalife	A/N/W, Conservation Materials
Paper cutter	Talas, Bookmakers
Polyester film	Transilwrap, Conservation Materials
Polyethylene buttons	Conservation Resources
Press, standing	Gane Bros, Talas, Bookmakers
Pressing boards & blocks	carpentry shop
Punches	M & M Distributors Woodcraft
Rivets, brass	Tandy

Rulers	
Clear plastic	Abel, Paul Anderson
Stainless steel	Abel
Scalpel blades	Fisher
Scalpel handles	Bard & Parker, Talas, Thomas
Set square, stainless steel	Dick Blick, Rex
Shears -- Wiss #20	Roy E. Davis Co.
Smocks	Fashion Seal
Stamping press -- Kwik Print	Talas, Bookmakers
Straight edge	Paul Anderson
T-square, stainless steel	Dick Blick, Rex
Tape measure	Everett Hardware
Thread	
Linen	Talas, Conservation Materials
Waxed nylon	Sears
Triangle, stainless steel 45°	Dick Blick
Type	Bookmakers, Talas
Holders	Bookmakers, Talas
Spacers	Bookmakers, Talas
Velcro	London Fabrics
Weights -- Linotype slugs	local printing supply

CHEMICALS

Acetone	Fisher, Thomas, Conservation Materials
Ammonium carbonate	VWR
Aquapel	VWR
Calcium oxide	MCB
Carnabua wax	Conservation Materials
CO_2 tanks	local
Chromotography paper	Thomas
Enzymes	
Amylase	Sigma
Protease	Sigma
Trypsin	Sigma
Ethyl alcohol	VWR, Conservation Materials
Ferric chloride	VWR
Formaldehyde solution	VWR, Conservation Materials
Gelatin sizing	Thomas, Fisher
Glycerin	Thomas, Fisher
Graff's C-stain	Institute of Paper Chemistry
Heptane	Fisher, Thomas
Klu-cel G	Hercules
Lanolin	local
Magnesium carbonate	Thomas, VWR, Fisher, Conservation Matls
Methyl alcohol	Thomas, Fisher, Conservation Materials
Methyl cellulose	Talas, Thomas
Naptha VMP	local
Petroleum benzine, petroleum ether	Thomas, Fisher
Phenyl phenol	Capitol Scientific

Potassium lactate	Talas
Silica gel	Talas, Fisher, Thomas, Cons Matls
Thymol crystals, ACS grade	Thomas, Fisher, Talas, Cons Matls
Tolulene	Thomas, Fisher, Conservation Matls
Wei-To solution	Bookmakers, Conservation Materials
Xylene	Fisher, Conservation Materials

FURNITURE AND EQUIPMENT

Air compressor and accessories	Binks
Balance	
Mettler, top loading balance	Fisher
Ohaus beam balance	Thomas, Conservation Materials
Blender	Fisher
Board shears -- Vagelli	Gane Bros, Bookmakers, Talas
Calculator	Nabihs
Cart, books	DEMCO
Laboratory	Cole-Parmer
Chemical storage cabinet	Fisher
Compressor and spray gun	Dick Blick, Conservation Materials
Corner rounder	Hollinger
Creaser	Hollinger
Cutter paper -- Michael Miracle	A.B. Dick
Cutter, rotary	Conservation Materials
Double boiler -- Pyrex	Sears
Drill, paper	Thompson Litho
Dry mount press	S & W, Univ Products, Cons Matls
Drying cabinet, photo	local photography supply
Drying racks	Carpentry shop
Drying oven, with thermostat	Thomas
Easel	Asel
Exhaust fan or Fume hood	Fisher, Thomas
Filing cabinets, flat	Drafix
Lateral	
Finishing stove	Talas, Bookmakers

Hygrothermograph	Beckman, Conservation Materials
Lamps, drafting style	Dazor (2C-2324) G.E. Supply
Lighting	
Darkroom	Capitol Camera
Fluorescent	Verilux Luxor
Track	Summers Electric
Light table	Texas Art Supply
Lithography stones	Talas
Mat cutter	BOOKMAKERS Cons Materials TALAS
Micrometer	Briggs-Weaver
Microscopes	Fisher, American Optical
Paper cutter	local printing supply
Paper drill	local printing supply
pH meter	Beckman, Fisher
Felt etching blankets	Continental Felt
Glass weights	Acme Glass
Glass cutter	Acme Glass
Grinder	Woodline
Hand mixer	Sears
Hot plates	Fisher
Humidifier and dehumidifier	Sears
Plate glass weights	Maxey
Plough	Talas
Polyweld	Conservation Resources
Presses, lying	Bookmakers, Talas
Standing	Bookmakers, Talas

Presses, multi-purpose	Schwab Mascieubau
Pressing blocks	carpentry shop
Pressing boards	carpentry shop
Pressure cooker	restaurant supply
Refrigerator	local
Sabre saw	Sears
Sander	Sears
Sewing frame, keys and needles	Talas Bookmakers
Sharpening stones	
Water	Woodline Woodcraft
Oil	Conservation Materials
Sinks, large -- Kreonite	Grigsby
Skiving machine	Bookmakers, Talas
Slide projector -- Kodak	Sears
Stamping press -- Kwik print	Bookmakers
Step stools	Univ Products, Fisher, Highsmith
Stirrer, magnetic	Cole-Parmer
Storage cabinet, flame proof	Fisher
Strip heater	Cole-Parmer
Taboret	Canary Hill
Transformer	Fisher
Tray racks	carpentry shop
Type cases	Talas
Vacuum	Austin Vacuum, Cons Materials
Vacuum table	Process Materials Nascor
Velo-binder	PDP Systems
Weights, linotype slugs	local

HAND TOOLS

Air brush and kit	Texas Art Supply, Cons Materials
Awl	S & W Framing Supplies
Bamboo folder or knife	Aiko's Art Materials
Band nipper, Frnch	Talas, Bookmakers
Blower brush	local photography supply
Bone folders	Talas, University Products
Brayer, solvent resistant plastic	Dick Blick, Conservation Materials
Buffing wheel	Woodcraft
Burnishers	Bookmakers
Chisels	Woodcraft
Compass	Dick Blick
Dividers	Briggs-Weaver, Sears, S & W, Talas
Double boiler -- Pyrex	Sears
Dremel	Sears, Conservation Materials
Forceps	Conservation Materials, McCrone
Funnel	Fisher, Thomas, Cons Materials
Glass weights	Acme Glass, Maxey
Glue pot -- Nalgene	Fisher
Hammer backing	Talas
Hammer, carpenter	Jack Carlson
Handle letters and devices	Talas, Bookmakers
Hole punch	Brookstone
Hones and strops	Brookstone, Conservation Materials
Knives	
Bamboo	Aiko's Art Materials
Blanks	Woodcraft
Cartiledge	local

Knives	
Gold	Talas
Mat	Asel
Microprobe	VWR
Palate	Asel
Paring	Bookmakers, Talas
Utility	local
Loupes	Conservation Materials
Microprobe	VWR, Conservation Materials
Microspatula	VWR, Conservation Materials
Needles	
Dissecting	Fisher
Sewing	Gane Bros, Talas
Paint roller, foam	local
Paste strainer, horsehair	Aiko's
Pliers	S & W Framing, Cons Materials, local
Polishing irons	Talas
Punches	M & M Distributors
Rivets, brass	Tandy
Rulers	
Clear plastic	Abel
Stainless steel -- Bates National	Paul Anderson, Abel
Sander	Sears
Sanding block	Woodcraft
Sauce pan	local
Scalpel handles and blades	Talas, VWR, Bard & Parker, Fisher, Thomas, Talas,
Scissors	Dick Blick, Thomas, Cons Materials, local
Embroidery -- Wiss	University Co-op Local fabric shops

Set square, stainless steel	Dick Blick, Rex
Sharpening stones, water	Woodline
Oil	Conservation Materials, HARDWARE STORES
Shears -- Wiss #20	Roy E. Davis Co.
Spatula, micro	Fisher, Thomas, VWR, Talas, Cons Materials
Wooden	Aiko's
Soldering iron	Sears
Spoke shave	local
Spoon, wooden	Aiko's
Sprayers, plastic pressure -- Dahlia #2	Fisher, Conservation Materials
Spra-tool	Crown
Squeegee, rubber	local
Straight edge	Paul Anderson
T-square, stainless steel	Dick Blick
Tacking iron	Desmond Shaw, Conservation Materials
Tape measure, metric/English	Everett
Thermometer	Abbeon, Fisher, Thomas, Cons Materials
Timer	VWR
Trays, enamel	Fisher, Thomas
Plastic	Fisher, Thomas
Triangle, stainless steel 45°	Dick Blick, Rex
Tweezers	Fisher, McCrone, Thomas, Cons Materials
Type	Talas
Type holders	Talas
Type spacers	Talas

MATTING AND FRAMING MATERIALS AND SUPPLIES

Adhesives, paste, wheat starch	Talas, Univ Products, Cons Materials
PVA	Aabbitt, Conservation Materials
Adhesive, double-sided tape -- Scotch #415	Fastener Sales, Conservation Materials
Anti-static cloth -- Ilford	University Co-op Local photo supply
Art cor Board	Palmer Paper
Blotting paper	Univ Products, Talas, Light Impressions, Process Materials, Cons Materials
Board	
Acid-free corrugated	Univ Products, Process Matls, Cons Matls
Archival	A/N/W, Cons Resources, Cons Materials, Hollinger, Process Matls, Univ Products
Archivart photographic	Conservation Resources
100% rag	A/N/W, Chas. T. Bainbridge's Sons, PDP Systems, Process Matls, Cons Materials
Silversafe photo store	Process Materials
Board shears	Bookmakers
Brushes	Aiko's, Conservation Materials
Japanese	Talas, Conservation Materials
Bubble wrap	local
Buffing sticks -- Emery board	local, Conservation Materials
Carpentry tools	Jack Carlson
Cloth tape, gummed	Talas
Cutting mat -- Uchida	Texas Art Supply
Dry mounting press	S & W, Science Assoc., Cons Materials
Erasers	Paul Anderson
First Aid kit	local
Fome-Cor	University Products
Frames, custom made & wooden mounts	carpentry shop

Frames, metal section	Santa Fe Supply
Framing tools	S & W, Santa Fe Supply
Glass	Acme Glass
Glass cutter	S & W
Glass weights	Acme Glass, Maxey
Glassine, neutral pH	Talas, Conservation Materials
Heating strip (to bend Plexiglas)	Austin Plastic
Knife, utility	local
Linotype slugs, weights	local printing supply
Mat Board	see "Board"
Mat cutter	CAH Industries, S & W, Cons Materials
C & H	Chas. T. Bainbridge's Sons, Cons Matls
Oval	M & M Distributors, Cons Materials
Mat cutter lubricant -- Superkote	Conservation Materials
Mending plates, brass & flathead screws	S & W, Cons Materials
Microspatula	VWR, Conservation Materials
Paste, wheat starch	Talas, Univ Products, Cons Materials
Plexiglas	A-1 Plastics
Cleaner -- Brillianize	
Polyester film	Transilwrap, Conservation Materials
Polyethylene sheets	Plastic Suppliers
Polystyrene foam	Polyplastics
Razor blades	S & W Framing
Rulers	Abel, Paul Anderson
Scalpel and blades	Fisher, VWR
Staple gun	Miller Blueprint
Storage box, lig-free print box	Conservation Resources

Styrofoam sheets	Polyplastics
Thermo cutter	Abbeon

RESEARCH AND TESTING EQUIPMENT AND SUPPLIES

Acid-base indicator papers	Thomas, Fisher, Univ Products, Cons Materials
Air velocity indicator	
Balance -- Ohaus beam	Fisher, Thomas, Conservation Materials
Mettler top loading	Sargent Welch
Beakers -- Pyrex	Fisher, Thomas
Blender, king size	Fisher
Binocular loupe	Fisher, Conservation Materials
Blotting paper, neutral pH	Univ Products, Talas, Light Impressions Conservation Materials
Calculator	Texas Instruments
Camera and accessories	Olympic
Color change detection strips	Talas
Cotton balls	Chaston Medical and Surgical
Cotton rolls	Chaston Medical and Surgical
Cotton swabs	Chaston Medical and Surgical
Dissecting needle	VWR, Fisher
Droppers	Fisher, Thomas
Drying oven	Thomas
Electrode	Beckman
Filter paper	Fisher, Thomas
First Aid kit	local
Foot candle meter	E & I Co-op
Fume hood	Grigsby
Glove box, controlled atmosphere	Thomas
Goggles	Lab Safety Supply, Conservation Materials
Hand mixer	Sears
Hot plate	American Scientific

Humidity indicator paper	Talas, Conservation Materials
Humidity meter -- Humichek	Beckman, Conservation Materials
Hygrometer	Fisher, Brookstone, Abbeon, Cons Matls
Hygrothermograph	Forestry Supp., Weathertronics, Cons Matls
Kimwipes	Thomas
Light box	Texas Art Supply, VWR, Inst. for Research & Industry, NY Central Supply
Light meter	Capitol Camera
Micrometer	Briggs-Weaver
Microprobe	VWR, Conservation Materials
Microspatula	VWR, Conservation Materials
Microscopes	American Optical, Fisher, Olympus
Leitz Ortholux II & accessories	Optometric Inc.
Needles, dissecting	Fisher
Petri dishes	Fisher
pH meter	Fisher, Beckman
pH surface electrodes	Fisher, Beckman
pH test strips -- ColorpHast	Talas, Conservation Materials
Pollution indicator kit	
Psychrometer	Kahl Scientific, Fisher, Thomas, Bacharach
Pyrometer	VWR
Q-tips	local
Razor blades	S & W Framing
Respirators and protective gear	Lab Safety Supply, Conservation Materials
Safety cans and equipment	Conservation Materials, local
Scalpel blades and handles	VWR, Talas, Fisher, Thomas, Bard & Parker
Scissors	Dick Blick, Thomas, Cons Materials, local
Spatula	Fisher, Thomas

Spray equipment -- Dahlia #2	Conservation Materials
Stop watch	Abbeon
Stirrer, electric	Fisher
Magnetic	Cole-Parmer
Syringes	Fisher, local
Suction table	Nascor
Tape measures, metric/English	Everett
Test tubes and racks	local
Thermometer	Abbeon, Fisher, Conservation Materials
Timer, digital or electronic	Lux
Transformer	Fisher
Trays, enamel or plastic	Fisher, Thomas, University Products
Stainless steel	Cole-Parmer, Fisher
Tweezers	Dick Blick, Fisher, Thomas, McCrone, Conservation Materials
Ultraviolet examination lamps	Fisher
UV monitor -- Crawford	Science Associates
Utility knife and blades	S & W Framing
Vacuum aspirator	Cole-Parmer
Watch glasses	Fisher, Thomas

SUPPLIES

Adhesive, PVA	Aabbitt, Conservation Materials
Rice starch	Talas, Univ Products, Cons Materials
Wheat starch	Talas, Univ Products, Cons Materials
Adhesive tape -- Scotch #415	Fastener Sales, Co., Cons Materials
Anti-static cloth -- Ilford	Monarch, Miller, University Co-op
Beakers -- Pyrex	Fisher, Thomas
Board	
Acid-free corrugated	Univ Products, Process Matls, Cons Matls
Archival	A/N/W, Cons Resources, Univ Products, Cons Materials, Process Matls, Hollinger
Archivart photographic	Conservation Resources
Binders	Jim Walter Papers
Buffered	Conservation Resources, Cons Materials
Lig-free	Conservation Resources
Rag	Process Matls, A/N/W, PDP Systems, Cons Materials, Chas Bainbridge's Sons
Silversafe photostore	Process Materials
Book cloth -- Van Heek	A/N/W
Brushes	
Artist	Boku Undo, Dick Blick, Cons Materials
Bottle	Fisher, Thomas
Glue	Talas, Conservation Materials
Japanese	Aiko's Conservation Materials
Jewelers	Conservation Materials
Paste, PVA	Talas, Bookmakers, Conservation Materials
Buckram	Holliston, Talas, Bookmakers
Buffing sticks	local

Cheese cloth	local
Cloth, airplane linen -- Holitex	Talas, Bookmakers
Cotton balls	Chaston Medical & Surgical
Cotton rolls	Chaston Medical & Surgical
Cotton swabs	Chaston Medical & Surgical
Draft cleaning powder	Keuffel & Esser, local
Draft pad -- Opaline	University Products, Talas
Dropper	Fisher, Thomas
Erasers	Miller Blueprint, Talas, Paul Anderson
Felt	London Fabrics, Continental Felt
Filter paper	A/N/W, Fisher, Thomas
Fome-Cor	University Products
Glass weights	Acme Glass, Maxey Glass
Gloves, cotton	University Co-op
Latex	Lab Safety Supply
Goggles	Lab Safety Supply
Heat set tissue (L-tissue)	Process Materials, Bookmakers, Talas Conservation Materials
Kimwipes	Thomas
Leather	Bookmakers, A/N/W, Harmatan
Linen cord	Falkiner
Tape	Ulster, Univ Products, Cons Materials
Needles, dissecting	Fisher
Sewing	Gane Bros, Talas, Conservation Materials
Paper	
Blotting	Process Matls, Talas, Univ Products, Conservation Materials
Filter	Light Impressions, A/N/W

Paper	
Glassine	Fisher, A/N/W, Thomas, Talas, Univ Products, Cons Materials
Handmade	Cowley, Aiko's,Dieu Donné, Talas, Conservation Materials
Japanese	Aiko's, A/N/W, Talas, Univ Products Conservation Materials
Machine made	Talas, A/N/W, Light Impressions
Newsprint	local
Silicone release	Univ Products, Talas, Cons Materials
Parchment	Cowley
Plexiglas	A-1 Plastics
Cleaner	
Polyester, sheet	Transilwrap
Web	University Products
Polyethylene	Dick Blick, Talas, Univ Products
Respirator	Lab Safety Supply, Cons Materials
Scalpel	Talas, Fisher, E.G. Field
Blades	Bard & Parker, Fisher, Talas, Thomas
Smocks	Fashion Seal
Sound-proof ear muffs	Capitol Bolt
Syringe	Chaston Medical & Surgical
Trays, fiberglass	Austin Restaurant
Thread	
Linen	Univ Products, Talas, Bookmakers Conservation Materials
Nylon	Sears
Silk	Bookmakers, Talas
UV sleeves for fluorescent lights	Talas
Vellum	Cowley

A-1 Plastics of Austin
2210 Denton Dr. #100
Austin, TX 78758
(512) 837-2710

A.B. Dick
2205 Braker Ln.
Austin, TX 78758
(512) 835-7727

Aabbitt-Jade Adhesives Co.
2403 N. Oakley
Chicago, IL 60647
(312) 227-2700

Abbeon Cal. Inc.
123 Gray Ave.
Santa Barbara, CA 93101
(805) 966-0810

Abel Stationers
P.O. Box 10
Austin, TX 78767
(512) 837-8844

Acme Glass Co.
P.O. Box 214
200 Congress Ave.
Austin, TX 78701
(512) 472-1641

Ademco Photographic Ltd.
67 Deep Rock Rd.
Rochester, NY 14624
(716) 328-7800

Aiko's Art Materials Import
714 N. Wabash Avenue
Chicago, IL 60611
(312) 943-0745

American Angler Tackle Center
319 S. Lamar
Austin, TX 78704
(512) 474-8277

Reichert Scientific Instrument
P.O. Box 123
Buffalo, NY 14240
(716) 891-3000

American Scientific
210 Great S. W. Pkway
P. O. Box 3620
Grand Prarie, TX 75050
(214) 647-2000

Paul Anderson Co.
3485 Fredricksburg Rd.
P.O. Box 5910
San Antonio, TX 78201
(512) 734-8111

Andrews/Nelson/Whitehead
31-10 48th Ave.
Long Island City, NY 11101
(718) 937-7100

Asel Art Supply
218 West M.L.K. Blvd.
Austin, TX 78701
(512) 477-1762

Austin Plastic & Supply
2320-D Beatrice Cove
Austin, TX 78758
(512) 836-1025

Austin Restaurant Supply
409 1/2 B E. Ben White
Austin, TX 78704
(512) 440-1488

Austin Vacuum
5242 N. Lamar
Austin, TX 78751
(512) 453-0421

Charles T. Bainbridge's Sons, Inc.
50 Northfield Ave.
Edison, NJ 08817
(201) 225-9100

Bard and Parker
Division of Becton, Dickinson & Co.
Box 300
Lincoln Park, NJ 07035
(201) 628-0024

Beckman Instruments Co.
2500 Harbor Blvd. N.
Fullerton, CA 92635
(714) 871-4848

Belair Camera
1025 Westwood Blvd.
Los Angeles, CA 90024
(213) 208-5150

Binks Manufacturing Co.
9201 W. Belmont Ave.
Franklin Park, IL 60131
(312) 671-3000

Binswanger Glass Co.
300 S. Lamar
Austin, TX 78704
(512) 472-2421

Dick Blick Co.
P.O. Box 1267
Galesburg, Il 61401
(309) 343-6181

Boku Undo USA
110 Greene St.
New York, NY 10012
(212) 226-0988

Bookmakers, Inc.
2025 Bye Street, N.W.
Suite 502
Washington, D. C. 20006
(202) 296-6613

Bradford Paint
P.O. Box 1764
Austin, TX 78767
(512) 478-6426

Briggs Weaver Inc.
15301 IH 35 N.
P.O. Box 1743
Austin, TX 78767
(512) 926-9220

Brookstone Co.
127 Vose Farm Rd.
Peterborough, NH 03458
(603) 924-7181/9541

Butler Fixture
4926 N. 30th St.
Omaha, NB 68111
(402) 451-3602

Burks Reproduction & Supply Co.
4402 N. Lamar
Austin, TX 78756
(512) 454-9651

CAH Industries, Inc.
1595 Brummel Ave.
Elk Grove Village, IL 60007
(312) 593-0727/(800) 323-0300

Caddylak Systems, Inc.
201 Montrose Rd.
Westbury, NY 11590
(516) 333-8221

Canary Hill Galleries
3033 Fountain View Dr.
Houston, TX 77057
(7130 783-8990

Capitol Bolt Supply
6015 Dillard Circle
Austin, TX 78752
(512) 458-8858

Capitol Camera
5808 Burnet Rd.
Austin, TX 78756
(512) 459-4321

Capitol Scientific Inc.
P.O. Box 9250
Austin, TX 78766
(512) 836-1167

Jack Carlson Co., Inc.
P.O. Box 520
Brownwood, TX 76801
(915) 646-4544

Chaston Medical & Surgical Products
P.O. Box 423
Dayville, CT 06241
(203) 774-8541

Cole-Palmer
7425 N. Oak Park Avenue
Chicago, Il 60648
(312) 647-7600

Conservation Materials Ltd.
240 Freeport Blvd.
Box 2884
Sparks, NV 89431
(702) 331-0582

Conservation Resources International
8000-H Forbes Place
Springfield, VA 22151
(703) 321-7730

Continental Felt Co., Inc.
22 W. 15th St.
New York, NY 10011
(212) 929-5262

William Cowley
97 Caldecote St.
Newport Pagnell
Bukinghamshire MK16 ODB
England
44 1 61003

Crown Industrial Products Co.
12603 Stateline Rd. or
P.O. Box 326
Hebron, IL 60034
(815) 648-2424

Roy E. Davis
3000 Quebec St. or
P.O. Box 47548
Dallas, TX 75247
(214) 688-0652

DEMCO Educational Corporation
P.O. Box 7488
Madison, WI 53707
(608) 241-1201

Dieu Donne Paper Co.
Three Crosby St.
New York, NY 10013
(212) 226-0573

David Dobbs Enterprises, Inc.
Rt. 3 Box 22 B-1
U.S. 1 North
Jackson Blvd.
St. Augustine, FL 32084
(904) 824-6171

Draphix, Inc.
3865 Elm St. or
P.O. Box 7276
Denver, CO 80207
(303) 393-0452

Everett Hardware Co.
718 W. 29th St.
Austin, TX 78705
(512) 474-6679

Falkiner Fine Paper
117 Long Acre
Covent Garden
London WC2E 9PA
England
01-240-2339

Fashion Seal Uniforms
Seminole Blvd.
100 Terrace
Seminole, FL 33542
(305) 324-1500

Fastener Sales Co.
P.O. Box 9226
Fort Worth, TX 76107
(817) 335-1448

Fisher Scientific Co.
711 Forbes Avenue
Pittsburgh, PA 15219
(412) 562-8300

Forestry Suppliers Inc.
P.O. Box 8397
Jackson, MS 39204
(601) 354-3565

Gane Bros. and Lane, Inc.
1400 Greenleaf Ave.
Elk Grove Village
Chicago, IL 60007
(312) 593-3360
or
P.O. Box 20754
Dallas, TX 75220
(214) 357-7343

Gaylord Bros., Inc.
P. O. Box 4901
Syracuse, NY 13221-4901
(315) 457-5070

G.E. Supply
Div. of General Electric
3101 Longhorn, suite 116
Austin Texas 78759
834-1341

Jim Walter Papers
P.O. Box 9366
San Antonio, TX 78204
(512) 227-9234

J. Barcham Green
Hayle Mill
Maidstone
Kent ME15 6XQ
England
44 622 674343

Max Grigsby
5805 Callahan
San Antonio, TX 78228
(512) 680-2833

Harmatan Leather
Unit J
Penfold Industrial Estate
Imperial Way, North Watford
Hertfordshire
England
9 23 38453

Hercules, Inc.
Hercules Plaza
Wilmington, DE 19894
(302) 594-5000

J. Hewit & Sons, Ltd.
Kinauld Leather Works
Currie, Edinburgh
EH14 5RS
England
031-449-2206/7
or
Sales Office
3 Prowse Place
London NW1 9PH
England
01-485-6252
Telex: 25960 EUROTL G

The Highsmith Co., Inc.
1 Mile East, Hwy 106
Fort Atkinson, WI 53538-0800
(414) 563-9571

Hollinger Corporation
3810 South Four Mile Run Drive or
P.O. Box 6185
Arlington, VA 22206
(703) 671-6600

Holliston Mills, Inc.
P.O. Box 478
Kingsport, TN 37662
(617) 357-6141 or (800) 251-0451

Hooper Camera Stores
5216 Lankershim or
P.O. Box 376
North Hollywood, CA 91601
(818) 762-2846

Institute of Paper Chemistry
P.O. Box 1039
Appleton, WI 54912
(414) 734-9251

Instruments for Research & Industry
(I^2R)
P.O. Box 159 N.
Cheltenham, PA 19012
(215) 379-3333

Johnson Acrylic Display
8823 Timber Cross
San Antonio, TX 78250
(512) 681-7068

Kahl Scientific Instruments
P.O. Box 1166
El Cajon, CA 92022
(619) 444-2158

Keuffel & Esser Co.
3672 West Chase
San Antonio, TX 78233
(512) 653-6259

The Kimac Company
478 Long Hill Rd.
Guilford, CT 06437
(203) 453-4690

Kleer Vu
P.O. Box 449
Brownsville, TN 38012
(901) 772-2500

Kurtz-Hastings, Inc.
Dutton & Darnel Rd.
Philadelphia, PA 19154
(215) 632-2300

Lab Safety Supply
P.O. Box 1368
Jamesville, WI 53547-1368
1-(800) 356-0783

Light Impressions Corp.
P.O. Box 940
Rochester, NY 14603
(716) 271-8960

Lights Fantastic
7532 Burnet Rd.
Austin, TX 78757
(512) 452-9511

London Fabrics
2438 W. Anderson Lane
Austin, TX 78757
(512) 458-2214

Lux Scientific
519 Eighth Avenue
New York, NY 10018
(212) 594-3633

M.C.B. Reagents
2909 Highland Avenue
Cincinnati, OH 45212
(513) 631-0445

M & M Distributors
P. O. Box 727
Freehold, NJ 07728
1-(800) 526-2302

Maxey Glass
515 E. Seventh St.
Austin, TX 78701
(512) 478-6459

McCrone Accessories & Components
2820 S. Michigan Ave.
Chicago, IL 60616
(312) 842-7100

Miller Blue Print
P.O. Box 2065
Austin, TX 78768
(512) 478-8793

William Minter Co.
1948 West Addison
Chicago, IL 60613
(312) 248-0624

Monarch Paper Co.
P.O. Box 18568
Austin, TX 78760
(512) 443-7112

Nabihs Inc.
519 Davis St.
Evanston, IL 60201
(312) 869-6140

Nascor
Box 706
Sag Harbor, Long Island, NY 11963
(516) 725-0153

Nassan Camera
Four New Hyde Park Rd.
Franklin Square, NY 11010
(516) 328-3181

New York Central Supplies
62 Third Avenue
New York, NY 10003
(212) 473-7705

Olympus Corporation of America
Precision Instrument Division
Two Nevada Drive
New Hyde Park, NY 11042
(516) 488-3880

Optometric, Inc.
600 Kenrick, Suite A-8
Houston, TX 77060
(713) 445-7007

PDP Systems of Austin
3342 Bee Cave Rd.
Suite C
Austin, TX 78746
(512) 327-2967

P. Systems
1791 Harper St. N. W.
Atlanta, GA 30318
(404) 352-2222 or
1-(800) 241-7831

Tech Science International
10690 Shadow Wood St.
Suite 128
Houston, TX 77043
(713) 932-8143

Palmer Paper Co.
3180 Irving Blvd.
P.O. Box 47487
Dallas, TX 75247
(214) 631-7460

Plastic Corp.
P.O. Box 380126
Duncanville, TX 75138
(2140 298-6151

Polyplastics
P.O. Box 760
Cedar Park, TX 78613
(512) 259-0250

Process Materials Corporation
301 Veterans Blvd.
P.O. Box 368
Rutherford, NJ 07070
(201) 935-2900

Reichert Scientific
Rex Supply
519 Thompson Lane
Austin, Tx 78742
(512) 385-8591

S & W Framing Supplies
120 Broadway
Garden City Park, NY 11040
(516) 746-1000

Sargent Welch
3403 Century Circle
Irving, TX 75062
(214) 579-9200

Schwab Maschienbau
HauptstraBe 102
D-8126 HohenpeiBenberg
West Germany

Science Associates
Box 230
31 Airpark Rd.
Princeton, NJ 08542
(609) 924-4470

Sears
1000 E. 41st
Hancock Shopping Center
Austin, TX 78751
(512) 452-9211

Desmond Shaw
Five Rickard Close
Cherry Hinton
Cambridge CB1 4LG
England

Sigma Chemical Corporation
P.O. Box 14508
St. Louis, MO 63178
(314) 771-5750

Daniel Smith, Inc.
4130 First Avenue, South
Seattle, WA 98134
(206) 223-9599

Summers Electric
3910 S. Industrial Dr.
Suite 100
Austin, TX 78744
(512) 462-0300

TALAS
213 W. 35th St.
New York, NY 10001-1996
(212) 736-7744

Tandy Leather Co.
5318 Cameron Rd.
Austin, TX 78723
(512) 454-6740

~~Texas Art Supply Co.~~
~~5318 Cameron Rd.~~
~~Austin, TX 78723~~
~~(512) 454-6740~~

Thomas Scientific
99 High Hill Rd.
at I. 295
Swedsbourogh, NJ 08085
(215) 574-4500

Thompson Litho Supply, Inc.
1636 E. 51st St.
Austin, TX 78723
(512) 458-9237

Transilwrap Company
1118 Quaker St.
Dallas, TX 75207
(214) 630-1417

Twentieth Century Plastics, Inc.
3628 Crenshaw Blvd.
Los Angeles, CA 90016
(213) 731-0900

Twinrocker Paper
RFD 2
Brookston, IN 47923
(317) 563-3210

Univrsity Co-op
2246 Guadalupe St.
Austin, TX 78705
(512) 476-7211

University Products, Inc.
P.O. Box 101
Holyoke, MA 01041
(413) 532-3372

VWR Scientific Inc.
P.O. Box 152643
Irving, TX 75015
(214) 659-0930
1-800 392-3338

Van Heek Textiles
Postbus 72
7600 AB Almelo
The Netherlands
05490-18961

Verilux, Inc.
P.O. Box 1512
Greenwich, CT 06837
(203) 869-3750

Weathertronics
P.O. Box 41257
Sacramento, CA 93841
(916) 481-7576

Woodcraft Supply Corp.
P.O. Box 4000
Woburn, MA 01888
1-(800) 225-1153

Wooline Company
1731 Clement Ave.
Alameda, CA 94501
(415) 521-1810

Ulster Weaving Co. Inc.
148 Madison Ave
New York N.Y.10016
212 684-5534

Source: University of Michigan Library. Preservation Office.

PRESERVATION FLYER NO. 2: PRESERVATION SUPPLIES

HOW DO "PRESERVATION SUPPLIES" DIFFER FROM OTHER SUPPLIES INTENDED FOR USE IN LIBRARIES?
Archival quality preservation supplies are specifically designed to be non-damaging. Paper products are acid-free, adhesives are acid-free and reversible, man-made materials such as polyesters are chemically stable, and cloth items are made from 100% cotton. These supplies serve to prolong rather than shorten the useful life of library materials.

WHAT TYPES OF MATERIALS SHOULD BE AVOIDED?
RUBBER BANDS because some are high in sulphur and can severely damage library materials as they decompose; further, they crush and tear books and paper quite easily. METAL PAPER CLIPS can also tear and gouge paper as well as cause damage and staining when they rust. ADHESIVES: before using any adhesives, check first with the Conservation Unit (3-6980), 1010 Buhr . The Head of the Conservation and Book Repair Unit will provide advice on archivally-sound alternatives and can, on request, supply libraries with acceptable adhesives. VARNISHES should never be used on library materials.PRESSURE SENSITIVE TAPES other than the Archival Aids Document Repair Tape supplied by Distribution and Supply should not be used. Magic-type tapes, mending tapes, and book tapes are manufactured under various brand names and are generally not acid-free nor are they reversible, despite some claims to the contrary. The stains they leave over time are difficult or impossible to remove. Repairs on rare or valuable materials should not be attempted; these items should be sent to the Conservation Unit for treatment with Japanese mending paper.

WHAT PRESERVATION SUPPLIES ARE AVAILABLE IN-HOUSE?
The following supplies are stocked on a regular basis and can be ordered (using a standard Supply Request form) from Distribution and Supply:

Cotton Pull Fasteners ("pink ties"; two sizes)
Brown Cotton Tape (spools)
Ademco Archival Aids Document Repair Tape
Acid-free Envelopes (several sizes)
Acid-free Pamphlet Boxes (several sizes)
Plastiklips (three sizes)
Acid-free Paper (two sizes)

Further information on sizes and uses can be found on pages 2 and 3 of this flyer.

SHOULD THESE SUPPLIES BE USED FOR OFFICE MATERIALS?
No. Items such as Plastiklips, Document Repair Tape and acid-free envelopes should be reserved for use on collection materials.

CAN I PLACE AN ORDER FOR SOMETHING NOT STOCKED IN-HOUSE?
Yes. Telephone or write to the Preservation Office and explain what you need. Office staff will check current supply catalogs and will place the order for you. When the materials arrive, they will be sent to you. The costs are generally charged to the Preservation Supplies Budget.

PRESERVATION SUPPLIES AVAILABLE FROM DISTRIBUTION AND SUPPLY

ITEM	DESCRIPTION	USE
Pink cotton pull fastener	A 1/4" wide flat tape that is twice threaded through a small disk to allow tape to be fastened around books by pulling one end of tape through the disk. Available in 18" and 24" lengths.	For tying books with loose, warped or detached covers or pages. Similar to the cotton tape available in rolls.
Brown cotton tape	A 1/4" wide flat tape (similar to the pink pull fasteners) available in 72 and 1000 yard spools.	For tying books with loose,warped or detached covers or pages which are too large for the pink pull fasteners.
Ademco Archival Aids Document Repair Tape	An extremely thin, pressure-sensitive archival repair tape that is non-yellowing, reversible in alcohol,highly transparent, tear resistant, and in the neutral pH range (acid-free). It will not discolor items to which it is applied. Available in rolls 1" x 98′.	For mending page tears. Expensive and therefore restricted to book repairs. Not intended for office use. Not intended for use on rare or valuable materials.

Acid-free envelopes	Made of opaque, sturdy archival quality paper to protect contents from staining or discoloration due to acid migration. The flaps are ungummed and seams are secured with acid-free adhesive. Sizes available: 6 x 9" 7 1/2 x 10 1/2" 9 x 12" 10 x 13" 11 1/2 x 15"	Suitable for pamphlet storage.
Acid-free pamphlet boxes	Constructed of heavy, lined boxboard covered with durable textured dark green paper.(All construction materials are acid-free.) Inside dimensions of available boxes: 10 1/4 x 4 x 7" deep 12 1/4 x 4 x 9 1/4" deep 13 x 3 1/2 x 10" deep 14 1/2 x 3 x 10 3/4" deep	For sorting sets of pamphlets, periodicals and other unbound publications.
Plastiklips	Plastic paper clips will not mar, rust or tear papers.Sizes and quantities available: 1 x 3/8" small 1000/box 1 x 1/2" medium 500/box 1 3/8 x 3/4" large 100/box	Use in place of metal clips for fastening extraneous notes, forms, etc., to books. Not to be used on office materials.
Acid-free Paper	Acid-free paper can be used for photocopying pages to be tipped into valuable materials. 8 1/2 x 11" (in reams) 8 1/2 x 13" (in reams)	Not to be used for standard photocopying or office materials/reports, etc.

SOLINET

Southeastern Library Network, Inc.
Plaza Level, 400 Colony Square
1201 Peachtree Street, N.E.
Atlanta, Georgia 30361
Telephone (404) 892-0943

SOME SOURCES OF CONSERVATION/PRESERVATION SUPPLIES & EQUIPMENT

SOLINET PRESERVATION PROGRAM
Leaflet #2.1
October 1986

The following list includes companies that provide supplies, equipment, and (in a few cases) services that may be useful in conservation and preservation activities. Each entry includes the company's name, mailing address, and (when available) phone number. In the right column is a brief indication of the product or products available through each company. Those listed as "general" suppliers carry a wide variety of products.

Inclusion in this list does not imply SOLINET endorsement, nor does the omission of any supplier indicate censure. This leaflet will be revised from time to time, as additional suppliers are identified.

Abbeon Cal, Inc. 123 Gray Avenue Santa Barbara, CA 93101 805-966-0810	equipment
Absorene Manufacturing Co. 1609 North 14th Street St. Louis, MO 63106 314-231-6355	surface cleaning materials
Aiko's Art Materials Import 714 North Wabash Chicago, IL 60611 312-943-0475	papers & supplies
AIRDEX 2100 West Loop South Suite 820 Houston, TX 77027 713-963-8600	disaster recovery service dehumidification

American Freeze-Dry, Inc. 411 White Horse Pike Audubon, NJ 08106 609-546-0777	disaster recovery services
H. W. Andersen Products, Inc. 6034 Chester Avenue, Suite 101 Jacksonville, FL 32217 904-737-2444	fumigation equipment
Andrews/Nelson/Whitehead 31-10 48th Avenue Long Island, NY 11101 212-937-7100	paper & binding materials
Applied Science Laboratory 2216 Hull Street Richmond, VA 23224 804-231-9386	Barrow paper test kit
Art Handicrafts Co. 3512 Flatlands Avenue Brooklyn, NY 11234 212-252-6622	rivets
Bendix Corporation National Environment Instruments Division P. O. Box 520, Pilgrim Station Warwick, RI 02888	gas detector kits
Blackmon-Mooring-Steamatic Catastrophe, Inc. (BMS CAT) International Headquarters One Summit Avenue, Suite 202 Fort Worth, TX 76102 817-926-5296	disaster recovery services
Bookmakers 2025 Eye Street, NW, Room 502 Washington, DC 20006 202-296-6613	general
Calumet Photographic, Inc. 890 Supreme Drive Bensenville, IL 60106 800-225-8638	storage enclosures photographic supplies
Bill Cole Enterprises P. O. Box 60 Wallaston, MA 02170-0060	Mylar sheets & envelopes

Conservation Materials, Ltd. 340 Freeport Blvd Box 2884 Sparks, NV 89431 702-331-0582	general photographic
Conservation Resources Int'l 1111 North Royal Street Alexandria, VA 22314 703-549-6610	general photographic storage
The Dickson Company 930 South Westwood Drive Department H13 Addison, IL 60101 800-323-2448	temperature/humidity recorder
Document Reprocessors 55 Sutter Street, Suite 1120 San Francisco, CA 94104 415-362-1290 or 1-800-4-DRYING	disaster recovery services
Dorlen Products 7424 West Layton Avenue Greenfield, WI 53220 414-232-4840	surface water detectors
E.I. DuPont de Nemours & Co., Inc. Fabrics & Finishes Dept. Industrial Products Division Wilmington, DE 19898	Mylar rolls
Durasol Drug & Chemical Co. 1 Oakland Street Amesbury, MA 01913	dry cleaning pads
Environmental Tectonics Corp. County Line Industrial Park Southhampton, PA 18966 800-523-6079	environmental monitoring equipment
Fire Equipment, Inc. 57 Hicks Avenue Medford, MA 02155 617-391-8050	fire extinguishers and detectors
Fisher Scientific Company 711 Forbes Avenue Pittsburgh, PA 15219 412-562-8300	environmental monitoring equipment

Franklin Distributors Corp. P. O. Box 320 Denville, NJ 07834 201-267-2710	photographic storage
Gallard-Schlesinger 584 Mineola Ave. Carle Place Long Island, NY 11514 516-333-5600	sulphur dioxide test paper
Gane Bros. & Lane, Inc. 1400 Greenleaf Avenue Elk Grove Village, IL 60007 312-437-4880	bookbinding supplies & equipment
Hamilton Industries 1316 18th Street Two Rivers, WI 54241	map cases
Hollinger Corporation P. O. Box 6185 3810 South Four Mile Run Drive Arlington, VA 22206 703-671-6600	general photographic storage
I.C.I America Inc. Plastics Division Wilmington, DE 19897	polyester sheets/rolls
Robert Jacobson: Design P. O. Box 8909 Moscow, Idaho 83843 208-882-3749	preservation posters
Jon Kennedy Cartoons P. O. Box 1488 Little Rock, AR 72203	preservation posters
The Kimac Company 478 Long Hill Road Guilford, CT 06437 203-453-4690	inert plastics
Library Binding Service 2134 East Grand Avenue P. O. Box 1413 Des Moines, IA 50305 515-262-3191, 800-247-5323	pamphlet binders preservation photocopying service
Light Impressions Corporation 439 Monroe Avenue P. O. Box 940 Rochester, NY 14603 800-828-6216	general photographic storage

Littlemore Scientific Engineering Railway Lane, Littlemore Oxford, OX4 4PZ ENGLAND	ultraviolet light meter
Magnetic Aids, Inc. 133 North 10th Street Paterson, NJ 07522 201-790-1400	non-knifing bookends
McDonnell Aircraft Company Box 516 St. Louis, MO 63166 314-232-0232	disaster recovery services
William Minter 1948 West Addison Chicago, IL 60613 312-248-0624	ultrasonic welder for encapsulation
Moisture Control Services 216 New Boston Street Woburn, MA 01801 617-933-2180	disaster recovery services
Northstar Freeze Dry Mfg. P. O. Box 439 Pequot Lakes, MN 56472 218-963-2900	freeze-dry chambers
Oce-Business Systems, Inc. 1351 Washington Boulevard Suite 3000 Stamford, CT 06902 203-323-2111	photocopier
Cole Palmer 7425 North Oak Park Avenue Chicago, IL 60648 312-647-0272	environmental monitoring equipment pH testing materials
Photofile 2000 Lewis Avenue P. O. Box 123 Zion, IL 60099	photographic storage
Pilcher-Hamilton 1850 South 25th Avenue Broadview, IL 60153 312-343-6660	Mylar, polyester film
The Pine Cone Blake Building P. O. Box 1378 Gilroy, CA 95021 408-842-7597 or 4797	mini vacuum cleaner

Plastic Reel Corporation of America Brisbin Avenue Lyndhurst, NJ 07071 201-933-5100, 212-541-6464	film, audio, and video containers
Pohlig Bros., Inc. P. O. Box 8069 Richmond, VA 23223 804-644-7824	paper supplies
Printfile, Inc. Box 100 Schenectady, NY 12304 518-374-2334	photographic storage
Process Materials Corporation 301 Veterans Boulevard Rutherford, NJ 07070 201-935-2900	general
Raychem Corporation TraceTek Products Group 300 Constitution Drive Menlo Park, CA 94025 415-361-6693 or 415-361-6484	water-sensing cable system
Re-Oda Chemical Engineering Co. 100 Industrial Parkway P. O. Box 424 Chagrin Falls, OH 44022 216-247-4131	restoration of fire damaged books
Rohm & Haas, Plastics Division Independence Mall West Philadelphia, PA 19105	ultraviolet filtering sheets
Science Associates, Inc. Box 230, 230 Nassau Street Princeton, NJ 08540 609-924-4470	environmental monitoring equipment
Solar-Screen Company 53-11 105th Street Corona, NY 11368 212-592-8223	ultraviolet filtering materials
Solomat Corporation Glenbrook Industrial Park 652 Glenbrook Road Stamford, CT 06906 800-932-4500	environmental monitoring equipment

TALAS -- Technical Library Service 213 West 35th Street New York, NY 10001-1996 212-736-7744	general
Taylor Instrument Company Consumer Products Division Sybron Corporation Arden, NC 28704 704-684-8111	environmental monitoring equipment
Teleprint Publishing 7 Elliewood Avenue Charlottesville, VA 22903 800-582-0026, 804-979-3420 (in VA)	preservation photocopying service
Arthur H. Thomas Co. P. O. Box 760 Philadelphia, PA 19105 215-574-4500	environmental monitoring equipment pH testing materials
3M Film & Allied Products Div. 3M Center St. Paul, MN 55101	polyester sheets/rolls tape for encapsulation
Total Information Limited P. O. Box 79 Luton, Bedfordshire LU3 1SE England (0582) 412684	photocopier
Transilwrap Company 2615 North Paulina Street Chicago, IL 60614 212-594-3650	photographic storage
University Products P. O. Box 101 South Canal Street Holyoke, MA 01041 800-628-1912	general photographic storage
Verd-A-Ray Corporation 615 South Front Street Toledo, OH 43605 419-691-5751	low UV fluorescent tubes
VL Service Lighting Bank Street, CN 4100 Hightstown, NJ 08520-9946 609-448-0700	lighting products

S. D. Warren Company 225 Franklin Street Boston, MA 02101	acid neutral & alkaline paper
Washi No Mise R.D. #2 Baltimore Pike Kennitt Square, PA 19348	paper supplies
Wei T'o Associates, Inc. P. O. Drawer 40 21750 Main Street, Unit 27 Matteson, IL 60443 312-747-6660	deacidification supplies & equipment book dryer/exterminator

Section 10: Education and Training for Preservation

The Library of Congress
A National Preservation Program Publication
Preservation Leaflet No. 6
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Audiovisual Resources for Preserving Library and Archival Materials

Purpose

The National Preservation Program Office of the Library of Congress is building a collection of audiovisual resources produced in the United States and abroad. They are available for loan. As the collection grows, it will eventually encompass all aspects of the care and treatment of library and archival materials. It is intended as an aid in familiarizing the professional librarian-archivist and the general public with the problems and challenges encountered in preserving those library and archival collections which have been judged to be indispensable as records of civilization. At the same time, some of the techniques discussed may also serve to prolong the useful life of materials which are to be discarded once they have served the purpose for which they were created. Many of these resources may be used as supplements in a variety of educational and training situations.

What Is Available?

The collection comprises films, videotapes, 35mm slides, and magnetic tapes, and represents a variety of approaches to the care and treatment of library and archival materials. Each entry consists of the title, producer, place and date of publication, type of material, length of the presentation and a brief description of the contents. Criteria for selection include: overall accuracy of the information, general usefulness to the library and archival preservation-conservation community, and technical quality of visual images and sound.

Except for those resources produced by the Library of Congress, the lending of these materials does not constitute either explicit or implicit endorsement by the Library of the opinions, procedures, and techniques presented.

Conditions

Organizations and institutions in the United States may borrow materials for up to two weeks. Scheduling is on a first-come first-served basis; high demand items may be restricted to shorter loan periods. Items desired on a particular date for use in a workshop or other special program should be reserved several months in advance. The completion of the brief survey which accompanies the item is mandatory. The National Preservation Program Office pays one-way postage. Borrowers are responsible for return postage and for insuring the parcel in accordance with instructions that accompany the material.

Materials may not be duplicated without written authorization and may not be used for any commercial purposes whatsoever. Most of the items on this list can be borrowed or purchased from their producers. It is the responsibility of the borrower to observe all applicable copyright laws and regulations.

Help Us Build the Collection for You

The National Preservation Program Office actively solicits information on the availability of additional audiovisual resources in this field. All those who produce, or know of, materials not included in our collection are encouraged to send descriptive information and source and cost data to the address listed at the end of this leaflet.

Basic Conservation Procedures: Encapsulation. Nebraska State Historical Society, Lincoln, 1980.
Type: 61—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 8 minutes
Contents: A basic introduction to the subject. Explains the advantages and disadvantages of encapsulation, presents some of the techniques used at Nebraska State Historical Society.

Basic Conservation Procedures: Environmental Controls. Nebraska State Historical Society, Lincoln, 1980.
Type: 114—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 19 minutes
Contents: Presents four environmental factors—air pollution, temperature, humidity, and light—affecting the condition of archival collections. Discusses monitoring procedures and offers possible solutions.

Basic Conservation Procedures: Storage and Handling. Nebraska State Historical Society, Lincoln, 1981.
Type: 93—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 13 minutes
Contents: Covers acidity in paper, shelving, storage boxes, pressure-sensitive tape, paper clips, and rubber bands.

Basic Conservation Procedures: Surface Cleaning. Nebraska State Historical Society, Lincoln, 1980.
Type: 81—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 11 minutes
Contents: Explains in detail the importance of surface cleaning. Suggests guidelines to be followed and illustrates some of the standard products and methods used.

Binding the Past for the Future. Heckman Bindery, North Manchester, Indiana, s.d.
Type: 16mm optical sound color motion picture
Length: 16 minutes
Contents: Demonstrates the work processes of a large commercial domestic bindery.

Book Conservation Techniques: Leather Treatment and Dressing. University of Oregon, Portland, 1978.
Type: ¾-inch color videotape cassette
Length: 50 minutes
Contents: For advanced students in the conservation of library and archival materials. Professional conservator Jack Thompson demonstrates the cleaning, treatment, and dressing of leather bookbindings; and discusses the properties of chemicals used. Also demonstrates the removal of paper clips and pressure-sensitive tape. The treatment of leather is a controversial subject.

Books in a Bind. (Series). Georgia ETV, Atlanta, 1979.
Type: ¾-inch color videotape cassette
Length: See below.
Contents: A series, intended for the layman, demonstrating "how to" techniques for repairing, re-covering, and binding books. Instructor Sandy Cohen—assistant professor of English, Albany State College, Georgia—studied bookbinding in Europe and the United States. He gives step-by-step instructions, describing the tools and techniques employed for rebinding and repairing books by the "kitchen method." No mention is made of the acid content of modern paper and its rapid deterioration if not deacidified.

Individual titles and running times:

1. **Tools and Materials, Covering a Paperback, Endpaper Techniques.**	30 minutes
2. **Repair of a Slightly Damaged Book, Hand Lettering, Paste Recipe, Sources of Bookbinding Supplies, Reference Works.**	29 minutes
3. **15th and 18th Century Binding Styles, Marbling Edges, Pulling, Mending, Pressing.**	29 minutes
4. **Marking up, Sawing, Sewing.**	29 minutes

5. **Rounding and Backing the Spine, Lining up and Lacing in the Cover Boards.** 29 minutes
6. **Trimming and Marbling Edges, Sewing Headbands, Lining up the Cover Boards.** 29 minutes
7. **Working the Leather Cover: Trimming, Beveling Edges. Attaching to Binding.** 30 minutes
8. **Decorative Touches (Smoothing and Polishing, Tooling, Embossing), Gold Leaf Lettering, Attaching End Papers, Preservatives.** 29 minutes

The Care and Handling of Books. Yale University, New Haven, 1980.
Type: 70—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 28 minutes
Contents: An introduction to the proper handling of library materials. Emphasizes the causes of damage and deterioration. Shows simple preservation techniques. Concentrates on books, but briefly mentions microfilm and methods used to prepare bound materials for microfilming.

Cleaning of Prints, Drawings, and Manuscripts: Dry Method. Smithsonian Institution, Washington, 1977.
Type: 54—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 17 minutes
Contents: Intended as a staff training aid and suitable for a basic conservation workshop. Illustrates several methods of removing light soil from flat paper objects. Notes types of papers not suitable for cleaning by the methods discussed.

COM: A Better Way. National Micrographics Association, Silver Spring, Maryland, s.d.
Type: 111—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 12 minutes
Contents: Describes the role of Computer Output Microfilm (COM) as used in information handling systems. A comprehensive overview for general audiences. Slanted toward the promotion of COM uses.

Curatorial Care: The Environment. American Association for State and Local History, Nashville, 1977.
Type: 80—35mm color slides and audible pulse magnetic cassette tape
Length: 18 minutes
Contents: The presentation is similar to classroom instruction on reading technical manuals used by the armed forces. The emphasis is on terms used in dealing with museum environments. It also discusses staff responsibilities for maintaining the proper environment.

The Curatorial Examination of Paper Objects. Smithsonian Institution, Washington, 1976.
Type: 154—35mm color slides (2 carousels) and synchronized silent pulse magnetic cassette tape
Length: 32 minutes
Contents: Discusses in detail some of the methods used in evaluating paper objects at the time of accessioning, exhibition, or framing.

The Enemies of Books. Condyne, Dobbs Ferry, N.Y., 1981.
Type: ¾-inch color videotape cassette
Length: 20 minutes
Contents: Subtitled **A Preservation Primer,** writer-producer-narrator Diana Vincent-Daviss presents in a well-organized fashion up-to-date preventive maintenance procedures recommended for use in libraries and archives.

From Wood Fiber to Paper. State University of New York, College of Forestry, Syracuse, 1959.
Type: 16mm optical sound color motion picture
Length: 21 minutes
Contents: A thorough overview of modern industrial papermaking. Describes the composition of wood and how it is made into paper. Does not discuss the harmful (acidic) effects of rosin size and alum additives.

Hand Papermaking at Barcham Green. s.l., s.d.
Type: 16mm optical sound color motion picture
Length: 14 minutes
Contents: Shows the step-by-step processes used in manufacturing high-quality paper at this well-known British firm.

Handmade Japanese Papermaking. s.l., s.d.
Type: 16mm optical sound color motion picture
Length: 30 minutes
Contents: Shows in detail the ancient methods used in Japan for producing high quality handmade paper. For specialized audiences versed in the technique of papermaking. English narration.

The Hinging & Mounting of Paper Objects. Smithsonian Institution, Washington, 1976.
Type: 158—35mm color slides (2 carousels) and synchronized silent pulse magnetic cassette tape
Length: 36 minutes
Contents: The specialized content limits the audience to curators responsible for large collections of flat paper objects. Discusses four types of hinges.

The Hygrothermograph. Smithsonian Institution, Washington, s.d.
Type: 80—35mm color slides and synchronized audible pulse magnetic cassette tape
Length: 16 minutes
Contents: A technical discussion of one of the basic tools used in monitoring relative humidity levels in libraries and archives, presented by R. Organ. A high degree of technical knowledge and manual dexterity on the part of the viewer is assumed.

Japanese Hand-Made Paper. Japan National Tourist Organization, Tokyo, s.d.
Type: 16mm optical sound color motion picture
Length: 14 minutes
Contents: For general audiences. Discusses and demonstrates the step-by-step process used in producing handmade Japanese paper and explains and shows the uses of this type of paper. Exquisite color and scenery.

Keeping Harvard's Books. Harvard University, Cambridge, s.d.
Type: 154—35mm color slides (2 carousels) and synchronized silent pulse magnetic cassette tape
Length: 30 minutes
Contents: Discusses basic techniques in the shelving and handling of books. Aimed at deck attendants and their supervisors.

Limp Vellum Binding. Library of Congress, Preservation Office, Washington, 1972.
Type: 16mm optical sound color motion picture (2 reels)
Length: 52 minutes
Contents: For advanced rare book conservators. Presents in meticulous detail the techniques employed in medieval times for binding volumes in pliable (limp) vellum leather.

Lockheed-Stanford Book Drying, 1979. Stanford University, Stanford, California, 1979.
Type: 87—35mm color slides and audible pulse magnetic cassette tape
Length: 10 minutes
Contents: Documents the vacuum drying of books at the Lockheed Company after the basement flood at the Stanford University Library.

The Making of a Manuscript. University of Toronto, Toronto, 1974.
Type: ¾-inch color videotape cassette
Length: 23 minutes
Contents: A college level presentation, tracing the history of a medieval manuscript book, including the materials used and the processes employed in its manufacture. Examples shown are from the great medieval collections of libraries in Cambridge, Oxford, London, Vienna, Brussels, Toronto, and New York. Intended as a visual aid in classroom lectures, the production is descriptive rather than analytical or interpretive.

The Making of a Renaissance Book. Plantin-Moretus Museum, Lunenburg, Vermont, 1969.
Type: 16mm optical sound b&w motion picture
Length: 20 minutes
Contents: Shows the methods employed during the Renaissance in making a type face, casting and setting type; and demonstrates printing on a contemporary press at the Plantin-Moretus Museum. Binding is not discussed. For general as well as professional audiences.

Micrographics: A Medium of the Future. National Micrographics Association, Silver Spring, Maryland, s.d.
Type: 124—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 15 minutes
Contents: A comprehensive overview of micrographics for general audiences. "Forecasts" future use of the medium.

Paper: Matting and Framing. American Association for State and Local History, Nashville, s.d.
Type: 80—35mm color slides and audible pulse magnetic cassette tape
Length: 20 minutes
Contents: Discusses the problems associated with the removal of flat paper objects from old mats and frames. Details the basic problems in preserving previously mounted flat paper objects and suggests methods of removal. Shows some of the uses of Japanese paper, wheat paste, and mylar.

Preservation: An Investment for the Future. National Preservation Program Office, Library of Congress, Washington, 1982.
Type: 16mm optical sound color motion picture or ¾-inch color videotape
Length: 14 minutes
Contents: A comprehensive overview of preservation activities at the Library of Congress.

Preservation Technology—1980s. Library of Congress, Washington, 1983.
Type: ¾-inch U-Matic color videotape cassette or ½-inch VHS color videotape cassette
Length: 52 minutes
Contents: Portions of this presentation were recorded live at the annual conference of the Association of Research Libraries in Scottsdale, Arizona, May 1982. It contains the presentations of the following officials of the Library of Congress: William J. Welsh, Deputy Librarian of Congress; Peter G. Sparks, Director for Preservation; William R. Nugent, Assistant Director, Automated Systems Office; and David G. Remington, Chief, Cataloging Distribution Service. It presents advances made in new preservation technologies and their application at the Library of Congress, such as gaseous mass deacidification of paper; the use of digital optical and analog videodisks; and the production of catalog cards with digital optical disk equipment.

"NOT AVAILABLE"

Prints Off the Ice: The Conservation and Restoration of the Nova Zembla Prints. William P. van Oort and Peter Poldevaart, Rijksmuseum, Amsterdam, 1980.
Type: 16mm optical sound color motion picture
Length: 25 minutes
Contents: Records the painstaking restoration of sixteenth-century prints recovered from the island of Nova Zembla, Russia, having been left there by a Dutch expedition. Discusses the use of enzyme paper separation techniques.

Recording a Restoration. American Association for State and Local History, Nashville, 1978.
Type: 80—35mm color slides and audible pulse magnetic cassette tape
Length: 17 minutes
Contents: A basic introduction to the complexities of historical preservation. Intended mostly for staff charged with the custody and processing of historical records.

The Removal of Pressure-Sensitive Tape from Flat Paper. Smithsonian Institution, Washington, 1977?
Type: ¾-inch b&w videotape cassette
Length: 20 minutes
Contents: Demonstrates the removal of pressure-sensitive tape by mechanical methods and by application of chemical solvents. Shows simple repairs and the removal of stains in paper created by adhesive tapes. A classroom lecture-type presentation intended for beginning conservators and conservation aides.

The Restoration of Books: Florence 1968. Royal College of Art, London, 1968.
Type: 16mm optical sound color motion picture
Length: 45 minutes
Contents: For general as well as specialized audiences. A panoramic view of restoring medieval books damaged in 1966 during the flood of Florence, Italy, by the Arno River.

Shelving and Handling of Books. Newberry Library, Chicago, 1975.
Type: 80—35mm color slides, nonsynchronized magnetic cassette tape and script
Length: 22 minutes
Contents: Intended mainly for staff working in the stacks of a large research or special library. Instructs on the basics of conservation procedures while handling materials. Shows the procedures used by the Newberry Library of Chicago.

Simple Repairs for Library Materials. Yale University, New Haven, 1981.
Type: 74—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 17 minutes
Contents: A basic primer on preventive maintenance of library collections. Demonstrates simple repair techniques which can be carried out with minimum staff training.

Site Security. American Association for State and Local History, Nashville, 1973.
Type: 80—35mm color slides and audible pulse magnetic cassette tape
Length: 20 minutes
Contents: The focus is on museum site security, which is easily adaptable to libraries and archives.

Storage and Care of Films, Filmstrips, Filmloops, Transparencies and Slides. State University of New York at Buffalo, 1978-79.
Type: 75—35mm color slides and synchronized silent pulse magnetic cassette tape (audible beep present and out of synchronization in places)
Length: 9 minutes
Contents: Produced under the sponsorship of the U.S. Office of Education, this and the following five productions emphasize temperature and humidity controls, storage procedures, and handling techniques for library and archival materials. Although aimed at professional librarians, preservation is discussed at the basic level. Emphasis is on "active collections" rather than on the long-term storage of library and archival materials. The six presentations have identical introductions and about fifteen slides in common.

Storage and Care of Magnetic Tape. State University of New York at Buffalo, 1978-79.
Type: 77—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 9 minutes
Contents: See description under **Storage and Care of Films . . .**

Storage and Care of Maps. State University of New York at Buffalo, 1978-79.
Type: 69—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 8 minutes
Contents: See description under **Storage and Care of Films . . .**

Storage and Care of Microforms. State University of New York at Buffalo, 1978-79.
Type: 66—35mm color slides and synchronized silent pulse magnetic cassette tape (audible beep present)
Length: 7 minutes
Contents: See Description under **Storage and Care of Films . . .**

Storage and Care of Phonorecords. State University of New York at Buffalo, 1978-79.
Type: 68—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 7 minutes
Contents: See description under **Storage and Care of Films . . .**

Storage and Care of Photographs and Negatives. State University of New York at Buffalo, 1978-79.
Type: 65—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 7 minutes
Contents: See description under **Storage and Care of Films . . .**

The Wee Blue Blossom. Linen Industry Guild, Lambeg, Northern Ireland, 1933?
Type: 16mm b&w optical sound motion picture
Length: 22 minutes
Contents: For general audiences. Shows in detail the production of Irish linen from harvesting the fibers to weaving the cloth. Dated but useful.

Windows on the Past. Illinois State Archives, Springfield, s.d.
Type: 100—35mm color slides and synchronized silent pulse magnetic cassette tape
Length: 10 minutes
Contents: An overview of the Illinois Regional Archives Depository System showing an organized, statewide effort to preserve archival materials. Some of the methods used (microfilming, lamination, storage) are not in keeping with current practice.

AUDIOVISUAL RESOURCES FOR THE PRESERVATION AND CONSERVATION OF LIBRARY AND ARCHIVAL MATERIALS

DISASTER RECOVERY
PLANNING FOR PRESERVATION PROTECTION
ENVIRONMENTAL CONTROL
REPAIR TECHNIQUES BINDING
PAPERMAKING
CLEANING
RESTORATION LEATHER TREATMENT
ENCAPSULATION
CONSERVATION WORKSHOP PROCEDURES

LOAN PROGRAM

The National Preservation Program Office of the Library of Congress is building a collection of audiovisual resources produced in the United States and abroad on aspects of the care and treatment of library and archival materials. Many of these materials can be used as valuable supplements in a variety of educational and training situations. They are available for loan through the Library of Congress Preservation Reference Service.

WHAT IS AVAILABLE:

A list of the audiovisual resources—files, videotapes, slide shows—currently available for loan may be obtained by writing or calling the Preservation Office. This regularly updated list provides a brief description of the contents of each presentation, the primary audience, the length, and the types of equipment required. A supplementary bibliography is also available. It lists audiovisual materials in a study collection which, though not part of the loan collection, may be viewed by appointment in the Preservation Office at the Library of Congress.

HELP US BUILD THE COLLECTION FOR YOU

The National Preservation Program Office encourages all those who have produced or become aware of audiovisual resources not included in its collection to send descriptive information and source and cost data to the address listed to the left.

National Preservation
Program Office
Library of Congress
Washington, D.C. 20540

CONDITIONS:

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LJ SERIES ON PRESERVATION No.1

EDUCATION FOR CONSERVATORS

A proposal for training conservators of library and archival materials

by Paul N. Banks

OBJECTS of art and craft; ethnographic and archaeological objects; significant monuments, buildings, and historic districts, and books, manuscripts, and other record materials have all come to be thought of under the rubric cultural property, and interest in the preservation of this broad category of the evidences of man's spirit and endeavor is growing apace.[1] I should like to mention three things which may help to place the conservation of library and archival materials into the broad context of the preservation of cultural property as a whole, my emphasis here being primarily on physical preservation rather than microfilming or other means of preserving solely intellectual content.

A few years ago a remarkable conference was held in Williamsburg and Philadelphia. This five-day meeting—one of the major organizers of which was the National Trust for Historic Preservation—brought together a group of 140 conservators and historic preservationists to discuss areas of common interest. The proceedings of the conference make a remarkable book.[2] Historic preservation is in many respects in about the same state of development as the conservation of library and archival materials, and I had the sense of looking in a slightly imperfect mirror and seeing my own profession. Among the major concerns of the participants were the philosophical and ethical bases for historic preservation, standards, the training of practitioners, and the education of the owners of historic property in the responsibilities and implications of preservation.

The year 1973 saw the formation of the National Conservation Advisory Council. Its origins, if not obscure, are complicated, but suffice it to say here that it has been funded thus far by grants from the National Museum Act, and that it maintains a secretariat in the Smithsonian Institution. The Council's mandate is to examine needs in the conservation of all types of cultural property, to make recommendations for solutions to these problems, and to study the advisability of some form of a national conservation institute. The Council has met the first provision of its mandate, at least in a general way, by the issuance of its preliminary general report, *The Conservation of Cultural Property in the United States*.[3] Of more specific interest, NCAC has a study committee on library and archives conservation, whose charge is to assess and report on the needs in that field. In the sphere of recommendations, the Council has published a report on regional centers, and a committee is studying the question of a national institute. It is not clear as yet what function a national conservation institute might serve in the conservation of library and archival materials.

The American Institute for Conservation of Historic and Artistic Works, the field's professional society, is undergoing a period of rapid growth, reorganization, and renewed concern for such questions as professional standards and ethics. AIC is re-examining its code of ethics, which emanated from the museum conservation field and thus is not entirely applicable to some other specialties of conservation, and it is exploring certification of conservators[4] and accreditation of training programs.

Paul N. Banks is Conservator at the Newberry Library, Chicago. This article is an edited version of a paper presented at a conference on a National Preservation Program for Libraries, given at the Library of Congress in December 1976

Conservation characteristics

Turning to the conservation of library and archival materials specifically, I would like to point out a few characteristics of this area which will influence the training required for conservators and conservation administrators. First, the field of library conservation (like all fields of physical preservation) is highly technical. Just as the professional librarian is concerned with Anglo-American Cataloging Rules and information theory, the conservator is concerned with the chemistry of materials, the monitoring of environmental systems, and the engineering of book structures. Furthermore, the technical aspects of conservation are complicated since they are concerned with pre-existing objects which have their own characteristics; in this sense, conservation perhaps has more affinities with medicine than with engineering.

Second, the ethical and philosophical framework within which conservation decisions must be made is not well developed. While there are some guidelines such as the code of ethics of the American Institute for Conservation that are applicable to objects which are acknowledged to be high artifacts and for which we thus feel an obligation to posterity, we have no rational philosophy for dealing with materials of intermediate artifactual value.[5] These are not types of questions for which there can ever be absolute answers, but we clearly need to try to develop greater consensus than exists at present.

Third, the problems of library conservation are highly diverse. We must deal with everything from large collections of deteriorating 19th Century books of little artifact value to illuminated manuscripts; we must deal with materials of widely varying intellectual as well as artifactual value; and we must deal on the technical level not only with books and manuscripts, but also with materials as diverse as microforms and Poe's raven—not the manuscript or first edition but the actual raven, stuffed, which is part of the collections of the Free Library of Philadelphia.

Fourth, the need for conservation of library and archival collections is both massive and urgent. For example, the 111 libraries which are members of the two major research library associations contain over 220,000,000 volumes, and the National Archives alone holds over 4,000,000,000 pieces. Significant portions of these collections are so deteriorated that there is imminent threat of their disappearance if steps are not taken soon.

Fifth, conservation is expensive by any standards, by any approach. For example, even though microfilming is correctly thought of as the least expensive method presently available of preserving brittle books, at $20 or $30 or $50 for an average volume, large amounts of money are clearly involved. And the cost of physical treatment, where that is indicated, is thus far frighteningly high.

And finally, the field of library conservation is, in that wonderful euphemism, a developing field. There are obviously as yet no training programs; the literature of the field is extremely spotty, both in quality and in coverage; there is little in the way of standards, and there are endless unsolved technical problems both large and small, for which in many cases answers are not even actively being sought. Even more important, it appears that library administrators are only just beginning to focus on the responsibilities of preserving collections.

Job descriptions

Education in conservation can only be discussed rationally if we have a reasonably clear notion of job definitions and descriptions. As in any new field, we thus far do not have such generally agreed-upon definitions. Regardless of what names are given to them, however, three general types of conservation personnel would seem to be needed: those who administer broad conservation programs; those who are trained in the technical and physical aspects of conservation; and those who execute actual conservation treatments at the workbench.

In addition to the physical or treatment aspects of library and archives conservation, there are a great many mass and bibliographical problems and policy matters which must be dealt with in an institution of any size, including cooperative ventures, library binding processing, and preservation microfilming programs. These types of activity clearly require the services of a *conservation administrator*.

Similarly, there is a great range of physical or technical aspects of conservation which need to be directed or executed by a person with specialized technical training. This person might be called the *conservator*.

Finally, in conservation laboratories or workshops, people are needed whose task is to execute the actual conservation treatment of objects. We might call these people *conservation technicians*. The training of the conservation technician seems to present fewer difficulties than that of other conservation personnel. Educational requirements would seem to be reasonably clear-cut, and a nearly ideal method of training, apprenticeship, is well established.

Ten or 20 years from now, when there are more thoroughly trained technical personnel and when standards of various sorts have evolved, it will be feasible for conservation administrators to operate effectively without themselves having technical training. For example, at some point in the future it should be possible, as it is not now, for an administrator to choose competent technical personnel on the basis of university degrees or some kind of professional board certification But in the present, incipient phase of the field, I simply do not know how one might go about effectively training library conservation administrators, and so I am simply going to sidestep this vexed question. I shall concentrate on the qualifications of the conservator, the person who it seems to me at the present time is the key to the development of the conservation field.

In the past ten years or so, since there has begun to be closer liaison among those concerned with the conservation of all types of cultural property, many of us have tended to look at the museum conservator as a model for the library conservator. This role model has served a vital purpose by suggesting the kinds of education and training required for conservation practice and the kinds of professional responsibilities and ethics involved.

There are also, however, some fundamental differences between library conservation and most aspects of museum conservation; library conservation involves, in addition to treatment of individual items of high value, mass problems.

The conservator is often looked upon primarily or exclusively as a craftsman, and indeed training in the craft of conservation is fundamental for the conservator, but I see the role of the library conservator somewhat more broadly. Because of the whole complex of technical (as well as ethical and esthetic) factors involved in the deterioration and preservation of books and manuscripts, we need a kind of conservation engineer. Indeed, this notion was proposed by Sheldon Keck 15 years ago, and has been mentioned occasionally since in the literature.[6, 7]

The justification for this quasi-engineer role for the conservator is the urgency for providing optimum environmental conditions for storage, use, and exhibition of collections. In moving about among libraries and archives, and in my own experience at the Newberry Library, I see quite clearly the lack of people who can speak with a degree of authority to administrators, buildings and grounds departments, library staffs, and, when major renovations or new buildings are contemplated, to architects and mechanical engineers. Environmental standards need to be described in detail, the technical feasibility of attaining them understood, and the risks of *not* attaining them spelled out to responsible officials. Moreover, existing conditions, including those created by new systems, need to be monitored.

Needs and priorities

Among the priorities which are often cited for advancing the field of library and archives conservation are the training of conservation administrators, the training of conservation technicians, and the education of librarians and archivists about conservation through publications, programs, courses, and seminars. There is no doubt that these are all urgent needs in the field as a whole. But because nearly every aspect of conservation involves complex technical issues, none of these worthy ends can be met effectively without the availability of thoroughly trained conservators. It would be like trying to supply health care without physicians.

Looking at priorities for the conservation needs of individual institutions, we are—or at least I am—led to the same conclusion. Only the merest handful of libraries and archives have immediate access to adequate technical knowledge, and it seems unarguable that activities or decisions which do not incorporate full understanding of their implications are hazardous. Since most of the first people trained will almost certainly be hired by institutions which do not have technically-trained people on their staffs, it would seem that these first people need to be conservators, if again we are to avoid a situation comparable to trying to supply health care without physicians. Moreover, even if it is decided right now to start a training program for conservators, it will probably be five years before the first graduates are available.

For these reasons I strongly advocate that one of the first priorities in the field of library and archives conservation, and certainly the first educational priority, is to train a cadre of conservators who can then help to fulfill other urgent needs in the field. I also feel quite strongly that the first training effort must try to concentrate on relatively mature, well-educated, and articulate people, perhaps people who have already had experience in library work or conservation; in other words, potential leaders, who can help to chart the course of conservation.

A training program

What, then, are some of the outlines of a training program for conservators? I think that the requirements for conservators demand that the training program be on the graduate level. To put the matter in rather pragmatic terms, if the conservator is to be really effective in preserving collections, he or she must have sufficient rank and

THE WASHINGTON POST

Self-Destructing Books

By Daniel Q. Haney

and the alum-rosin gives off sulfuric acid that eats the paper.

Combine this with rough handling, high humidity, heat, mold and cockroaches, and today's books don't stand a chance.

FOCUS

Fading books beset libraries

By Paul Van Slambrouck

America's vast resource of knowledge is slowly fading away

New life for disintegrating books

Damage in the Stacks

Research libraries foresee 'terrific crisis' as rate of book deteriorIation speeds up

By JACK MAGARRELL

WASHINGTON

College and university librarians, with increasing alarm, are watching thousands of their books self-destruct.

Chemicals in the paper of nearly all mod-

Forge, Pa. Large autoclaves at the center have the capacity to treat about 5,000 books per batch.

The cost of the diethyl-zinc treatment, in large-scale operation, is expected to be about $3 per book,

LIBRARIES HELPLESS AS MILLIONS FALL APART

Acid Time Bomb Destroying Books of Two Centuries

NATIONAL/INTERNATIONAL

Great books fail the test of time

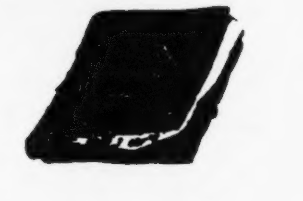
One More Crisis: Our Books Are Falling Apart

One More Crisis: Old Books Are Falling Apart and New Ones Are Even Flimsier

Millions of Valuable Books Are Disintegrating in Nation's Libraries

Library researchers are gathering dust

Paper-Making Techniques Cause Popular Literature to Bite the Dust



clout to be able to influence library policy; this implies the necessity for a graduate degree. (I disagree rather strongly with the statement in the proposed national program that training should encompass undergraduate students, although this may be appropriate at some point in the future.)

If this requirement is accepted, obviously the training program must be affiliated with or be within a university. We are really talking not only about training conservators, but, of necessity, about developing the whole field of library conservation. This also suggests that the university environment, which is traditionally hospitable to such activities as research, writing, and editing publications, professional societies, and so on, is the appropriate place for a conservation training program.

The curriculum for such a program might be divided into three broad categories: background, theory, and practice. In order to make informed decisions about conservation, it is necessary for the conservator to have sufficient broad background in order to make the decision in adequate perspective. Thus such courses as history of the book, descriptive bibliography, rare book librarianship, and perhaps a survey or core course in libraries and librarianship, which are offered at most library schools, should be included in the curriculum.

One of the main advantages of academic over apprenticeship instruction is the greater possibility of systematic coverage of theory. Thus such courses as the history, philosophy, and ethics of conservation; chemistry and technology of record materials; analysis and control of library environment; and conservation storage methods would need to be offered.

Finally, one of the most difficult aspects of the training of conservators is the necessity for learning much of the craft involved. The engineering aspects of architecture have evolved to the point that architects and engineers design buildings without having first served an apprenticeship in the building trades. However, this is not yet possible for the library conservator. Although it may come some day, we are still a long way from having manuals and computer programs from which binding and restoration methods for individual items can be designed and specified, or, perhaps equally important, evaluated.

Unless and until we have such theoretical bases for treatment, understanding of such work can only be learned by actually doing. The conservator must have training and practice at the workbench. I would expect that about half of the academic part of the training program must be spent in workshop courses in paper treatment and restoration, binding, and related subjects.

The great strength of academic training is the possibility of systematic progress and coverage in the curriculum, and the presumed gearing of the curriculum to the educational needs of the students. But this strength is also a limitation; there are apt to be some rather sharp differences between the academic and the real worlds. Thus it seems essential that a substantial part of the students' educational experience should be work outside of the institution in which the training program is based.

I would first like to propose, following the lead of the museum conservation training programs, that the students be sent to other libraries and archives on summer work programs. This not only could, but probably in many cases can only, be to institutions which do not have conservation facilities of their own. This will give the students a good, cold dose of what they will be confronted with when they face the real world. This can also be a good device for instilling a measure of humility in students. I well remember seeing a couple of Cooperstown graduate conservation students cleaning out and organizing a storeroom in the Bishop Museum in Honolulu a few summers ago.

Second, I am taking it for granted that an internship, probably of a year's duration, will be a requirement for the degree in library conservation, again following the lead of the museum conservation training programs. This, it seems to me, is the part of the students' training in which they are exposed to the real world of production and economic pressures as well as to a workshop different from the one in which they have received their training.

Internships in library and archives conservation present one great practical difficulty—there are far too few qualified workshops available thus far. One can hope that there will be a few more by the time that the first group of students is ready; in any case the internships will require a good deal of cooperation from many individuals and institutions, as well as considerable flexibility and imagination by the directors of the training program.

There will also be great difficulties in assembling an adequate faculty for a conservation training program. There are so few competent people in the field as it is, and, as in any field, subject competence does not guarantee pedagogical ability. The success of a training program will depend upon an enormous amount of flexibility, imagination, and cooperation among a great number of people and institutions.

What has been outlined here suggests a program of two years academic instruction plus a year's internship. It is clear that fully qualified and experienced conservators cannot be turned out in a three-year program; indeed, I have had some friendly arguments with some of my colleagues about the length of time required for training and the degree of responsibility which the graduate of such a program might be expected to assume. While I cannot really argue with those who say that the program should be longer, I believe strongly that it is unlikely that a longer program would be feasible, and in any case, I feel that we simply cannot wait any longer. If the program is well-designed and intensive, we can fill, with reasonable confidence, the yawning vacuum which now exists for people with any decent qualifications at all.[8]

Words of caution

It is vitally important that any training program be kept sufficiently distinct from a production workshop. While the pressures of production are clearly a necessary part of the real world for which the student must be prepared, such "realistic" preparation is part of the function of internship. The earlier, "in-school," part of the training should be geared to the students' educational needs, and the pressures of production in a busy conservation workshop are inimical to concentrating on these needs.

I have a few misgivings about the first major training program in library and archives conservation being in fact or in effect "federal." While there is little question that the Library of Congress has the greatest resources in physical preservation anywhere—resources of knowledge and of physical facilities, and a fine internal training program—this size and sophistication may in itself make it difficult for students who have trained there to adapt to smaller institutions or one with more primitive facilities or none at all. Similarly, the size and complexity of LC may make it difficult for students to understand how decision-making processes work, to get an overall perspective on all of the library-wide factors which influence deterioration and preservation, and so on.

While it is improbable that more than one adequate training program could be launched in the immediate future, it seems to me that there are a number of reasons why there should be more than one as soon as reasonably possible. Competing programs will inevitably have somewhat different emphases; they will help establish a broader base of implicit standardization of qualifications for practitioners; they may offer more bases for activities such as research and publication, and they will offer some healthy competition among each other. But if the first program is federal, it may be difficult to establish the second program, particularly in the present climate when there is widespread assumption of the necessity of federal support for any such program.

There is little question that the trend in the delivery of all types of conservation services is toward institutionalization. Not only does it seem that the best people and the best facilities are increasingly found in institutions, but it also seems inevitable that regional or cooperative facilities will play a growing role. This may leave private owners of important books and manuscripts with even less possibility than now exists for obtaining quality care for their collections.

Public institutions ignore the private collector at their peril, since, as the Rosenwald gifts to the Library of Congress so dramatically illustrate, privately-held materials very often end up in public institutions. The cost of adequate conservation treatment is in itself a powerful deterrent to the private collector obtaining proper care for materials, but it is important, in planning a national training program, to structure it in such a way that it does not inadvertently discourage the provision of means for private collectors to obtain quality services.

I do not mean to imply that these reservations are valid reasons for not starting a training program centered at the Library of Congress, but they do seem to be some potential pitfalls which should be kept in mind in planning a national training program for library and archives conservators.

Although concern about the conservators of library and archival materials has perhaps lagged behind interest in the conservation of other types of materials, there is considerable evidence that conservation of all types of cultural property is becoming a recognizable national priority. The advances that have been made in our own area of interest, particularly since the Florence flood a decade ago, are remarkable. But we are at a critical point. The stakes are too high, and the problems are too massive and complex, to risk continuing our efforts without adequately trained people. It is time for a training program for the key personnel in the conservation picture. Nor can we risk compromises on quality, particularly since the qualifications of personnel may be the only effective form of standards.

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Library and Archival Conservation, #290
Sally A. Buchanan

Spring 1987
Friday, 8-11 AM

Goal: The purpose of this course is to introduce students to the new field of library and archival conservation. It will provide a solid foundation in the theoretical, managerial, statistical, analytical, and practical application for an aspect of library science which has been practiced in a formal institutional setting for less than twenty years in the United States. Students can expect to explore both conservation administration and conservation hands-on techniques, with the understanding that such exposure will broaden and enhance their professional careers.

There is a required reading list. Students are expected to be prepared for each class for discussion and comparison of ideas and theories. A number of guest experts will join the class for lecture, interchange, and demonstration, and visits will be made to observe the conservation facilities at the U.C. Berkeley Libraries and other appropriate sites. **Either a final exam or a research project will be required as part of the course. This will be discussed and a decision made in the first class.**

January 23
Class Lecture
Administrative Issues in Conservation/Preservation Programs - An Overview

January 30
Administrative Issues - Establishing Programs: Broad Issues
Be prepared to discuss history and international, national, regional, local, and cooperative programs from the reading list.

February 6
Administrative Issues - Establishing Programs: Local Implementation
Be prepared to discuss assessing needs, setting priorities, obtaining objective facts by surveys and sampling, the challenges of providing access and the issues of conservation and collection management.

February 13
Administrative Issues - Program Components: Environmental Issues
Be prepared to discuss care and handling, heat, light, humidity, shelving, etc. from the readings.

February 20
Administrative Issues - Program Components: Brittle Books
Discussion will center around the cause of brittle paper, the grim statistics, what is being done, what local programs can and should do, how materials are selected, what are standards in the field and deacidification. Read carefully as this is a major and key issue in mass preservation.

February 27
Administrative Issues - Program Components: Disaster Planning and Recovery.
Class will exam disasters in libraries using the Los Angeles Central Library as an example for the issues which must be addressed both before and after disaster.

March 6
Administrative Issues - Program Components: Education
This session is devoted to educating staff, public, and obtaining conservation/preservation education for department staff. We will also look at the importance, or lack of it, in educating the broader public to the issues involved.

March 13
Administrative Issues - Program Components: Commercial Library Binding
Be prepared from your readings to discuss the standards, issues, decision-making, workflow of commercial library binding and how it fits the preservation picture.

March 20
Field Trip to U. C. Berkeley Library Binder

March 27
Spring Break

April 3
Protective Enclosures and Mass Preservation
Please be prepared for guest speaker by covering this topic on the reading list

April 10
Basic Repair and Care for Circulating Collections
Please be prepared for guest speaker by reading about topic from the reading list.

April 17
Paper Conservation: Rare and Unique Collections
Please, for a paper conservator, be prepared with readings and questions.

April 24
Book Conservation: Rare and Unique Collections
Same old story, please be prepared. A book conservator will demonstrate and discuss.

May 1
Conservation and Preservation - Future Prospects and Directions
Finish readings, come with questions, ideas. Final wrap-up.

May 8
Final Class - Visit to the UC Berkeley Conservation Department

Grades in this course will be established in the following way:
- Research Project or final exam - 50%
- Class discussion and participation - 25%
- Quizzes or in-depth class seminar - 25%

Office hours in Library School, Office F, 2150 Kittredge, 11:00 - 12:00 Fridays. Others arranged by appointment.

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New York, New York 10027

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14 East 78th Street, New York, New York 10021

LIBRARY AND ARCHIVES CONSERVATION PROGRAMS

January 1987

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IN ORDER TO MEET THE PRESSING NEEDS OF LIBRARIES, archives, and historical societies for conservators of books, manuscripts and other records materials, and for administrators of preservation programs, the Columbia University School of Library Service and the Conservation Center of the Institute of Fine Arts, New York University, offer two unique programs in these disciplines.

The conservator program, offered jointly by the two schools, is a three-year program for practitioners of the conservation of records materials. It consists of two years of course work and a year's internship in a recognized conservation laboratory. The program for preservation administrators is two years long; however, for those who already have a master's degree from a recognized library school, the program may be completed in one year. The School admits six students each year to the three-year conservator program and twelve to the two-year preservation administration programs.

The conservation and preservation programs are supported in part by the National Endowment for the Humanities and the Andrew W. Mellon Foundation.

THE PROGRAM FOR CONSERVATORS OF LIBRARY AND ARCHIVAL MATERIALS

The program for conservators, which is offered jointly with the Conservation Center, Institute for Fine Arts, New York University, requires 72 points of course credit to be taken in three years including two summers. The students' first two years will be devoted to formal academic study of paper chemistry, the structure and technology of records materials, their protection and care, the history of books and printing, historical and descriptive bibliography, and the administration of conservation programs. Intensive laboratory work in the treatment of materials is required throughout both years. The summer terms following the first and second years require planned summer projects to be conducted in cooperating libraries or archives. The third year consists of a two-term full-time internship in a working institutional conservation laboratory.

Upon successful completion of course work, summer projects and internship, the student will receive the degree of Master of Science (Library Service) and a Certificate in Library and Archives Conservation awarded by Columbia University.

THE PROGRAM FOR PRESERVATION ADMINISTRATORS

The program for preservation administrators can be taken either as a two-year program leading to a Master of Science (Library Service) degree and an Advanced Certificate in Preservation Administration for those entering without a graduate library school degree, or in one year leading to the Advanced Certificate for those entering with a master's degree in library science. The first year of the two-year program the student takes courses in history of books and printing, historical and descriptive bibliography, and library and archives conservation. The second year is devoted to the study of conservation and the administration of preservation programs.

The one year program for students with a previous master's degree in library service is devoted to specialized courses in conservation, administration of preservation programs, and general management. Students in the one-year program are required to take courses from the first year of the two-year program if they have not taken comparable courses previously.

Sixty-six points of course credit are required for the two-year program and thirty for the one-year program. Both the two-year and one-year programs may be taken on a part-time basis.

FACILITIES

In addition to the newly-renovated regular facilities of the School of Library Service, including its classrooms, the Book Arts Press, the media and computer laboratories and the Library Service Library, all located in Butler Library on Columbia's main campus at Broadway and 116th Street in Manhattan, excellent book conservation laboratories have been fitted out in Schermerhorn Extension, across campus. Several courses in the conservator program are taught in the new building of the Conservation Center of the Institute of Fine Arts, New York University, at 14 East 78th Street.

FINANCIAL AID

Many students attending the School of Library Service finance their studies with fellowship and scholarship grants from the University and other sources, with long-term educational loans, with part-time and full-time work-study arrangements, or with a combination of scholarship grants, loans and part-time work-study. The Associate Dean of the School of Library Service assists students or prospective students in working out satisfactory financial arrangements.

The students enrolled in these programs may apply for any of the large number of scholarship and fellowship grants, which range from partial tuition for one term to full tuition, that are available from the University as listed in the section on Financial Aid and Awards in the School's current *Bulletin*. These scholarships and fellowships are granted on a competitive basis.

The School provides additional support for conservator students. Because of the intensity of the program, conservator students are not encouraged to work part-time. Information on scholarship application procedures, student loans, and student employment can also be found in the School's *Bulletin*.

HOUSING

The University provides limited housing for both single and married graduate men and women who are regularly registered for an approved program of full-time academic work. Information on housing is provided in the School's *Bulletin*.

ADMISSION PROCEDURES AND REQUIREMENTS

General Admission Requirements

1. A bachelor's degree
2. A superior academic record
3. Acceptable scores on the Aptitude Test of the Graduate Record Examination
4. Evidence of personal maturity and professional motivation

Requirements for the Conservator Program

In addition to meeting the above requirements, applicants for the Conservator Program must meet the following requirements related to the practice of conservation treatment.

1. At least one year of college level chemistry, including one semester of organic chemistry
2. Submission of a portfolio of craft or artistic work that demonstrates manual ability and creative problem solving
3. Acceptable scores on a bookcraft aptitude test, to be administered by the School of Library Service
4. A personal interview

Requirements for the Preservation Administration Program

Applicants for the two-year program for preservation administrators must meet the general admission requirements stated above. Applicants for the one-year advanced program must have completed a master's degree in library service from a program accredited by the American Library Association.

Application Procedure

Application forms may be obtained from the School of Library Service by using the request at the end of this brochure. The form contains instructions regarding the Graduate Record Examination, official transcripts of record, and references to be submitted. The completed form is to be returned with the application fee of $35. This fee covers part of the cost of processing the application and is therefore not returnable and is not credited toward tuition.

Applicants for the conservator program will take the bookcraft aptitude test and submit their portfolio at the time they are interviewed for admission to the program, all of which will normally take place at the School of Library Service during April.

Applications and all supporting documents must be received in the School Office by 1 April for conservator applicants and 1 August for preservation administrator applicants. **However, administrator applicants seeking financial aid or university housing are strongly urged to have their applications and supporting documents in the office by 1 April.** Applications are not considered until all supporting materials are received.

Tuition and Fees

Tuition in 1986-87 is $380 per point (all courses in the programs are 3 points each). It is anticipated that tuition for 1987-88 will increase. For information on the Health and Service Fee and student health insurance consult the School of Library Service *Bulletin*.

PROGRAMS OF STUDY

CONSERVATOR PROGRAM

REQUIRED COURSES

Autumn term, first year

K5000x	Introductory technology and structure of records materials
K5100x	Fundamentals of conservation treatment (laboratory)
K6010x	Introduction to library and information science
K6032x	Fundamentals of organizing library collections
K8204x	Introduction to library and archives preservation

Spring term, first year

K5001y	Advanced technology and structure of records materials
K5101y	Intermediate conservation treatment (laboratory)
K5201y	Protection and care of records materials
K6071x	History of books and printing
K6392y	Reprography for libraries and archives

Summer term, first year

S5800	Summer field work for conservator students I

Autumn term, second year

K6365x	Introduction to descriptive bibliography
K7100x	Special problems in conservation treatment (laboratory)
K7102x	Treatment of manuscript materials (laboratory)
K8205y	Management of archives and manuscript collections
*G43.3741	Chemical problems in library and archives conservation I

Spring term, second year

K7101y	Advanced conservation treatment (laboratory)
K7501y	Administration of preservation programs
K8365y	Advanced descriptive bibliography
*G43.3740	Chemical problems in library and archives conservation II
*G43.3744	Individual problems in examination and treatment: Problems in paper conservation

Summer term, second year

S7800	Summer field work for conservator students II

Third year

K7900x & K7901y	Conservator internship

*At the Conservation Center, New York University

PRESERVATION ADMINISTRATOR PROGRAM

REQUIRED COURSES

Autumn term, first year

K6010x	Introduction to library and information science
K6021x	Information and reference services
K6032x	Fundamentals of organizing library collections
K6071x	History of books and printing
K8204x	Introduction to library and archives preservation

Spring term, first year

K6015y	Introduction to library administration
K6392y	Reprography for libraries and archives
	Requirement or elective
	Requirement or elective
	Requirement or elective

Summer term, first year

	Requirement or elective
	Requirement or elective

Autumn term, second year

K5000x	Introductory technology and structure of records materials
K6365x	Introduction to descriptive bibliography
K7510x	Conservation treatment for preservation administrators (laboratory) OR requirement or elective
	Requirement or elective
	Requirement or elective

Spring term, second year

K5201y	Protection and care of records materials
K7501y	Administration of preservation programs
K7510y	Conservation treatment for preservation administrators (laboratory) OR requirement or elective

K7581y	Preservation administration field work
	Requirement or elective

ADDITIONAL REQUIRED COURSES

K8055	Collection development and management
K8063	Academic and research libraries
K8205	Management of archives and manuscript collections

RECOMMENDED COURSES

K6033	Introduction to information science
S8017	Information systems analysis
K8031	Current problems in technical services
K8068	Libraries and public policy
S8208	Records management
K8365	Advanced descriptive bibliography

PRESERVATION ADMINISTRATOR PROGRAM

(Advanced Certificate)

REQUIRED COURSES

Autumn term

K5000x	Introductory technology and structure of records materials
K6365x	Introduction to descriptive bibliography
K7510x	Conservation treatment for preservation administrators (laboratory)
K8204x	Introduction to library and archives preservation
	Elective

Spring term

K5201y	Protection and care of records materials
K6071y	History of books and printing
K6392y	Reprography for libraries and archives
K7501y	Administration of conservation programs
K7581y	Preservation administration field work

RECOMMENDED COURSES

K6015	Introduction to library administration
S8017	Information systems analysis
K8055	Collection development and management
K8063	Academic and research libraries
K8205	Management of archives and manuscript collections
K8365	Advanced descriptive bibliography

DESCRIPTIONS OF SPECIALIZED COURSES

(For complete course descriptions, see current *SLS Bulletin*)

LS K8204x
Preservation of library and archival materials
Paul N. Banks
An introduction to issues and problems connected with the preservation of library and archival materials; types and causes of deterioration for various kinds of materials, storage and preventive maintenance, preservation of intellectual content through photographic reproduction and microforms, restoration of rare materials, organization of a conservation program, regional conservation centers, national activity in the field.

LS K5000x
Introductory technology and structure of records materials
Paul N. Banks
Underlying factors in the quality of records materials; concepts of permanence and durability and their assessment; introduction to paper technology and characteristics; other materials used in book and non-book records; modern book structures.

LS K5001y
Advanced technology and structure of records materials
Paul N. Banks
Advanced paper technology; paper testing methods and their significance; ancient and unusual records materials; materials used in restoration and treatment; evolution of book structures. (For conservator students only).

LS K5100x
Fundamentals of conservation treatment (laboratory)
Guy Petherbridge
Orientation in the fundamentals of conservation treatment through the study of historical and contemporary book forms, the fabrication of protective enclosures in the context of collections maintenance, and an introduction to conservation bookbinding practices. (For conservator students only).

LS K5101y
Intermediate conservation treatment (laboratory)
Guy Petherbridge
Conservation bookbinding and treatment processes for damaged and deteriorated bound material, testing procedures, documentation of condition and conservation treatment, laboratory safety, disaster salvage, and insect and fungal control methods. (For conservator students only).

LS K5201y
Protection and care of records material
Paul N. Banks
Environmental enemies and their control; protective storage methods; care in use, transportation, copying and exhibition; biological enemies and their control; disaster preparedness and recovery; conservation implications of building planning and modification. Includes consideration of non-book records materials as well as books and manuscripts.

LS S5800D
Summer field work for conservator students I
Paul N. Banks
Two weeks work in a commercial library bindery and two weeks in an in-house library mending and labeling operation. May be arranged outside of New York City by arrangement with instructor. (For conservator students only).

LS K7100x
Special problems in conservation treatment (laboratory)
Guy Petherbridge
Completion of several single book conservation treatment projects including decision-making and documentation; individual projects that explore special problems or areas of book treatment. (For conservator students only).

LS K7101y
Advanced conservation treatment (laboratory)
Guy Petherbridge
Advanced practice in single book treatment and housing procedures and study and documentation of historical bookmaking structures; development of technical criteria and specifications for large scale conservation and commercial library binding operations. (For conservator students only).

LSK7102x
Treatment of manuscript materials (laboratory)
Karl Buchberg
Documentation of condition; identification of media; aqueous and non-aqueous treatment; vellum and parchment manuscripts; consolidation of flaking media; mending and reinforcement of weakened supports. (For conservator students only).

LS K7501y
Administration of preservation programs
Carolyn Clark Morrow, coordinator
Determining preservation needs and priorities; formulating institutional policy and programs; staffing; brittle books programs; costs, budgeting and funding; cooperative, regional and national conservation programs; contracting for services and supplier relations.

LS K7510x or y
Conservation treatment for preservation administrators
Guy Petherbridge
Introduction to protective housing, treatment and testing techniques useful in library and archives collections maintenance. Laboratory practice to provide understanding of book materials and structures and the physical characteristics of book format collections. (For preservation administrator students only).

LS K7581y
Preservation administration field work
Carolyn Harris
A program of individual field experience and periodic group sessions, supervised by a member of the faculty, enabling students to apply preservation theory to the solution of practical administrative problems in a NYC area library or archives. (For preservation administrator students only).

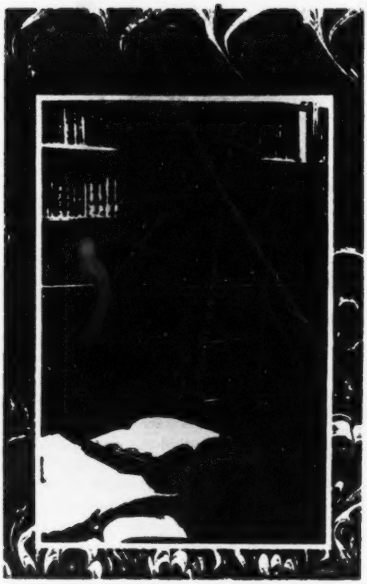
LS S7800D
Summer field work for conservator students II
Paul N. Banks
Two months of independent work in a library or archival collection of manageable size, with emphasis on planning and executing broad collections care. May be undertaken outside of New York City by special arrangement with the instructor. (For conservator students only).

LS K7900x and K7901y
Conservator internship
Paul N. Banks
Continuing development of binding and other treatment skills under professional supervision in the working environment of a recognized book or document conservation laboratory outside the University. (For conservator students only).

G43.3740-1
Chemical problems in library and archives conservation I & II
Norbert S. Baer and Norman Indictor
Physical and chemical properties of materials used in the fabrication, identification, and repair of books, photographs and manuscripts are studied with special emphasis on a critical examination of the literature. Methods of physical and chemical testing of paper and adhesive properties are considered. (For conservator students only; at the Conservation Center.)

G43.3744
Individual problems in examination and treatment: Problems in paper conservation
Margaret Holben Ellis
Technical and aesthetic considerations of various methods in paper conservation with particular reference to library and archival materials. Interactions of materials and complexities of treatment procedures are stressed. (For conservator students only; at the Conservation Center.)

The Milton S. Eisenhower Library
The Johns Hopkins University
Baltimore, Maryland 21218



PRESERVATION

CONSERVATION

◆

Workshops
Consultancies
Internships
Instructional Videos

◆

The Milton S. Eisenhower Library
The Johns Hopkins University

The extensive deterioration of research collections is a major problem of increasing concern to libraries and archives. Yet, frequently the sheer scope and complexity of the problem causes institutions to feel powerless to act. They may not know how to begin to address the issue; they may lack trained staff; or they may be using limited resources (money or personnel) ineffectively.

■ Consequently, a great need exists for preservation education that fosters pragmatic, technically sound, economical approaches to managing the preservation of books and flat works on paper. In response to this need the Andrew W. Mellon Foundation has awarded The Johns Hopkins University a three-year grant to conduct a program of education, technical training, and consultancy based upon the University's experience in a comprehensive preservation program begun in 1975 and in a similar successful Mellon grant (1982-85).

■ The University's preservation program operates under the direction of Glen Ruzicka, a trained conservator with over 10 years of experience in the Library of Congress's conservation department where he worked on the Library's top treasures. As head of the Collections Maintenance Department at the University's Milton S. Eisenhower Library, Mr. Ruzicka is administratively responsible for the commercial binding office, minor repair unit, preservation bindery, and paper conservation laboratory.

■ The preservation bindery occupies an area of 3200 square feet and is equipped to provide the full range of book restoration services required by a research library with more than 300,000 items in the general collections published prior to 1850 and in daily use. The size and variety of the preservation problems require a highly skilled professional staff capable not only of working quickly and efficiently on groups of materials from the general research collections requiring new case bindings, but also able to perform with intelligence and sensitivity

the complex restoration of rare and valuable items. Given the general unavailability of binders with the necessary combination of skills, an apprenticeship program was created, based upon the City and Guilds of London Institute model, but modified to meet the special needs of modern research libraries. This five-year program is certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training, and is based upon on-the-job training supplemented by study and related class work. Currently, three bookbinder/restorers in the bindery are graduates of the program and three apprentices are in various stages of apprenticeship.

■ The paper conservation laboratory, established in 1982, is fully equipped to deal with the preservation and restoration of non-book, artistic, and historic research materials: prints, drawings, maps, manuscripts, etc. Headed by a qualified, experienced paper conservator, the lab operates as a complement to the bindery and the other preservation units.

■ The recently funded program of education, technical training, and consultancy is designed to enable other institutions to benefit from the University's extensive facilities, experience, and expertise at no cost for services rendered; for consultancies only travel and related expenses for Hopkins staff must be borne by the requesting institution. A brief description of the four facets of the program—workshops, videotapes, consultancies, and internships—follows.

■ ***Workshops.*** While it is not feasible to expect the establishment of sophisticated preservation facilities in all libraries and archives, it seems reasonable to prepare library and archives staff to care for their collections in a manner appropriate to their needs. The workshops, conducted at Eisenhower Library, are offered twice a year and last five days each. One of the days is devoted to a field trip to preservation facilities in Washington.

Workshops concentrate on a pragmatic but sound preservation system, stressing hands-on learning and the care of collections as a whole rather than the specific item.

■ The workshops are designed to benefit staff responsible for the care and repair of library materials, but who lack formal training. While the emphasis is on supervised hands-on practice with a number of simple preservation techniques requiring minimal equipment, the important companion issues of preservation principles, organization, and decision making are dealt with as well. The Eisenhower Library's paper conservator leads sessions in the more specialized concerns of flat works on paper. All demonstrations are supplemented by a detailed manual prepared by Library staff. The workshops allow the Eisenhower Library to target the needs both of general research libraries and of archives or special libraries where manuscript material and other flat works may predominate.

■ ***Videotapes.*** Many institutions may not be able to take advantage of the limited opportunities for attendance at workshops. To aid in the broader diffusion of preservation knowledge, the Eisenhower Library is developing a one-hour videotape concentrating on the demonstration of basic preservation techniques designed to address problems common to all libraries. Six subjects will be covered: structural reinforcement of paperbacks; pamphlet cases; minor repair of damaged books; basic paper cleaning and mending; encapsulation; and simple protective enclosures. A copy of the manual developed for the workshops accompanies the tapes, which will be available for purchase in the spring of 1987 on a reproduction and handling cost recovery basis and will be offered in three formats: VHS, Beta, and ¾" U-matic.

■ ***Consultancies.*** Qualified staff from the University are available to provide on-site guidance to libraries and archives wishing to establish pres-

ervation work areas, and to help assess needs, identify priorities, and advise on courses of action. The Library offers six consultancies per year.

■ *Internships.* The ongoing preservation program at the University provides an ideal environment for special training through internship. The internships are available to library and archive staff who are preferably already skilled in basic preservation techniques. They are of four months' duration—three months working with book structures and one month in the paper conservation lab—and are offered twice annually, March-June and September-December, beginning in 1987. The period of internship is served in all preservation units, but individual needs and prior skills are taken into consideration in the design of each internship. Because the overall intent of the grant is directed toward encouraging the establishment of institutional programs, preference will be given to applicants from institutions with a strong commitment to preservation. No fee or tuition is required, and a stipend is available. Letters of application must be received by December 1 and June 1, for the March and September sessions, respectively, and must be accompanied by a résumé and a letter of support from the director of the sponsoring library or archives. Successful applicants will be notified by December 15 and June 15.

Inquiries about the program should be directed to:

Glen Ruzicka
Head, Collections Maintenance Department
The Milton S. Eisenhower Library
The Johns Hopkins University
Baltimore, Maryland 21218
(301) 338-8380
■

UC PRESERVATION IMPLEMENTATION PROJECT

UC Berkeley General Library Conservation Department

Schedule and Outline of Sessions

Session I: Preservation Replacement and Preservation Administration
November 3 - 21, 1986

Session II: Collection Management and User Education
January 26 - February 13, 1987

Session III: Library Binding
March 30 - April 17, 1987

Session IV: Conservation Treatment of Circulating and Rare Materials
June 1 - June 19, 1987

Session V: Preservation Program Planning: Wrap-up
August 24 - September 4, 1987

Session I: Preservation Replacement and Preservation Administration

WEEK I:

I. Introduction to the Preservation Implementation Project and the Berkeley campus.

  A. Introduction to Preservation

    1. General principles and issues in preservation

    2. Major preservation problems and solutions
      a. the chemistry of paper deterioration

    3. Administration of preservation programs
      a. introduction to the literature of preservation and preservation administration

II. Preservation Replacement Programs

  A. Tour of Preservation Replacement Division

  B. Overview: Lynn, Linda
    1. replacement options and variables determining choice
    2. decision trees

3. bibliographic control issues
4. cooperative programs
5. technical/physical quality standards
6. storage of film products

C. Tour of Library Photographic Service

D. Prefilming activities: Lynn, Linda

1. identification of materials
2. preparation of worksheets
3. bibliographer review- Jim Spohrer
4. searching- Rebecca Rottman

E. Preparation of materials: Linda, Susan Edelberg

1. newspaper preparation and problems
2. book collation and target preparation- Linda
3. preparation of replacement leaves

WEEK II:

F. Management of a preservation replacement unit: Linda

1. identification of materials: subject orientation, selector cooperation, use of condition survey information
2. record keeping
3. policies and procedures
4. preservation replacement vis a vis collection development

G. Components of a preliminary preservation replacement program: Lynn, Linda

REPORT 1: Design and implement a preservation replacement program tailored to local needs and availability of services. Include a chart of workflow and develop workforms for use in the program.

H. Practicum: Film production- Charles, Don

1. operating microfilm camera
2. handling fragile materials
3. film processing
4. printing positives
5. splicing, retakes
6. inspection, quality control

WEEK III:

I. Tour of a commercial microfilm laboratory (service bureau)

III. Preservation Program Planning

A. Organization and management of a conservation program: Barclay, Lynn

1. defining jobs, writing job descriptions
2. allocating services
3. interdepartmental cooperation
4. working with vendors
5. intercampus cooperation

B. Developing goals and priorities based on campus needs and current preservation activities

1. physical treatment: binding, protection, repair
2. storage, handling, disaster preparedness, education
3. replacement

REPORT 2: Gather home library policies and documentation of procedures that will impact/support a preservation program. Develop a list of additional needed preservation policies.

Session II: Collection Management and User Education

WEEK I:

A. Review of reports produced after Session I.

B. Collection condition and needs assessment: Barclay, Lynn

1. principles of collection surveying and random sampling: Barclay
   - a. construction of sampling frame
   - b. construction of random numbers
   - c. pilot survey and verification of variables

WEEK II:

2. survey of library collection: Barclay, Lynn
   - a. construction of sampling frame
   - b. construction of random numbers
   - c. pilot survey and verification of variables
   - d. gather survey data

REPORT 3: Collection condition survey of home library.

C. Care and handling of library materials: Lynn

1. damaging practices:
   - bookdrops
   - photocopying
   - shelving; oversize shelving; bookends
   - mutilation
   - access issues
   - thesis production for long term retention

2. staff and patron education
   - a. exhibits
   - b. handouts
   - c. outreach strategies

REPORT 4: Plan a year-long staff and user education effort, including specific materials used and a calendar.

D. Environmental monitoring and control: Cameron

1. technical review of effects of environment on library materials: Barclay

2. principles of environmental monitoring

3. tour of UCB's monitoring stations and familiarization with monitoring equipment

REPORT 5: Plan a program of environmental monitoring for home libraries, including lists of needed equipment, and floor plans with locations of monitoring stations.

Session III: Library Binding

WEEK I:

A. Review of reports produced after Session II.

B. Introduction to structure of library materials: Gill

1. Practicum: case binding construction

2. Materials and structures used in conservation binding
   a. endsheets
   b. adhesives
   c. buckram and cloth
   d. rounding and backing
   e. sewing styles: oversewing, through the fold, side/stab sewing

C. Overview: Library Binding

1. Preview of bindery training: Barclay

2. Binding program at Berkeley: Barclay

D. First time binding: Gary, Lynn

1. UCB's processing stream for first-time binding

2. Selecting appropriate binding styles

3. Interaction with the bindery

4. In-house binding manuals

WEEK II:

E. Rebinding

4. Practicum: Gill/Artie
   a. in-house preparation of fragile books for rebinding, a repair technique

F. Bindery training: Hans

1. Overview of binding and rebinding processes [Includes in-depth tour of facilities over four days.]

   a. styles of binding produced, limitations and strengths of each style
   b. complete process for each style
   c. equipment used at each station, limitations and most effective applications of equipment
   d. use of binding slips: how instructions correlate with treatments performed
   e. implicit "decision tree" used by bindery staff to handle problem materials

2. Management of in-house bindery

   a. workflow from campus through bindery; turn around time, production schedules, rushes and delays
   b. costs, overhead, and pricing structure
   c. differences between in-house binderies and commercial library binderies
   d. differences in procedures for different campuses and Northern and Southern binderies

WEEK III:

Bindery training continued

G. Review of bindery training: Barclay

REPORT 6: Review and upgrade as necessary home binding program, including recommendations.

Session IV: Conservation Treatment of Circulating Rare and Materials

WEEK I:

A. Review of reports done after Session III: Barclay

B. Maintenance and Repair of Flat Materials

1. Overview of flat materials- Nancy

   a. History of pictorial materials
   b. General care of pictorial materials and manuscripts
   c. General care of photographs

2. Repair of circulating flat materials- Nancy
    a. hands-on: map encapsulation, flattening, dry cleaning
    b. hands-on repairs: heat set tissue, paste, filling holes

WEEK II:

Repair of rare flat materials- Nancy

3. Curatorial issues of artifactual materials- Larry Dinnean, prints and photos curator, Bancroft Library

4. Manuscripts- Nancy
    a. tour of Bancroft ms. collection and overview of curatorial and conservaion issues- Bonnie Hardwick, Bill Roberts
    b. tour of Mark Twain papers- Bob Browning
    c. tour of map collection

C. Maintenance and Repair of Bound Materials

1. Overview of Bound Materials- Gill
2. Curatorial issues of rare books- Tony Bliss Bancroft Library

3. History of binding and conservation- Gill

4. Repair of rare bound materials- Gill
    a. demonstration: conservation binding techniques

5. Repair of circulating volumes- Gill
    a. Sorting books for treatment specification
    b. CTD treatment files
    c. hands-on: tip-ins, photocopying for insertion, furbishing, hinge tightening

WEEK III:

D. Administrative issues of repair programs- Barclay
1. repair programs in the institutional context
2. management of repair programs; how to choose what to repair

E. Tours of conservation programs: 1) In-house repair unit, UC Davis; 2) State Library Conservation Dept

REPORT 7: Review in-house repair program for the circulating collections. Implement needed improvements.

REPORT 8: Draft policy statements on the maintenance and repair of artifactual materials.

REPORT 9: Find one or two volumes (or maps, prints, etc.) that have been treated by a conservator. Reconstruct the process:

a) selection of item for treatment
b) treatment specifications- what were they (if any), who determined, and so on
c) selection of conservator
d) evaluate treatment based on what you have learned

F. Review of Preservation Program Planning documentation

1. Preparation of start-up and operating budgets.

2. Establishing processing procedures for work within unit, and from origin to destination.

4. Consolidation of findings and recommendations from Reports 1-6.

REPORT 10: Draft complete campus preservation program plan for submission to the University Librarians.

Session V: Preservation Program Planning: Wrap-up

WEEKS I & II:

A. Review of Reports 7-9: Barclay, Lynn

B. Individual campus preservation program plans (Report 10) review and recommendations: Barclay, Lynn

C. Review of Preservation Implementation Project documentation.

D. Evaluation of PIP: PIP participants, UCB staff

Section 11: Library Materials: Physical Nature and Treatment

Repairing Library Materials

excerpt from Guldbeck, Per E., THE CARE OF HISTORICAL
COLLECTIONS, Nashville, American Association for State & Local History, 1972.

Appendix I–Adhesives

There are thousands of adhesives on the market today capable of joining almost any combination of materials under a great variety of circumstances. But no one adhesive product can do all jobs, no matter how optimistic their promotional literature sometimes seems. It is impossible to list all the adhesives on the market by trade names —instead this discussion is a guide to the qualities of generally available types of adhesives.

Before using any unfamiliar adhesive, always read the label or the accompanying literature to be sure it meets your specific need. Or, if you cannot find an adhesive locally that will do what you want, write the manufacturer for technical literature. Most companies are quite obliging in this respect if you write using your institution's letterhead. If you feel that you would be overwhelmed by technical descriptions, ask the manufacturer for a specific recommendation for your problem. But you must provide as clear and detailed information as possible in requesting an appropriate adhesive. The following are some of the pertinent questions to consider in deciding what adhesive you need.

1. What specific materials will be joined? It is not enough to say, "cloth to metal"; say "linen canvas to stainless steel," or whatever the case may be.

2. Will you have a tight fit, or do you need an adhesive with filler qualities to compensate for two irregular surfaces with some voids? Remember most adhesives work best where the glue line is thin. Casein glue is about the only common exception; but it may not be otherwise suitable for your specific job, as it causes staining of some hardwoods, is not waterproof, and does not join some materials.

3. Do you want a rigid or a flexible bond? You may want an adhesive or caulking compound that will allow for dimensional changes in materials as a result of varying temperature and humidity changes. (Problems with wooden boats or leaking skylights are good examples of these conditions.)

4. How will the article be used—in a static exhibit, or out-of-doors in live demonstrations? In other words, what is the range of specific

thermal, climatic, and physical stresses, solvents, chemicals, and vapors to which you expect it to be subjected, either intermittently or continually?

5. How strong or permanent an adhesive is necessary? Do you want the repair to last forever or should the job be reversible if some of the pieces are not properly mated? Some adhesives are insoluble once they have set; while others may be soluble, but the solvent could harm the object. For example, removing adhesive soluble in alcohol and acetone from a piece of woodenware would cause no difficulty unless the piece were polychromed in a medium sensitive to these solvents. Test all of your materials before you proceed.

6. Under what conditions will the adhesive be applied—indoors in a warm room, in an unheated shed, in outdoor cold, or underwater? Many adhesives will not work well above or below a certain temperature and humidity range.

7. Do you want to apply the adhesive as a liquid for better penetration into joints or porous areas, or as a stiffer gel that will adhere to vertical or overhead surfaces?

8. What tools will you use to apply it—your fingers, a stick, brush, trowel, caulking gun, spatula, spray-gun, or roller? Some adhesives may affect certain types of bristles, are discolored by certain metals, clog spray guns, or affect the skin.

9. How long a working time (pot life) is necessary, or how quickly do you want the work to set up? Remember you can get "instant bond" or overnight hardening; each method has its own advantages and liabilities.

10. Finally, an important but often overlooked point: what is the shelf- or storage-life of the adhesive? There is no point to buying a year's supply if its storage life is only three months, or if it begins to break down in the jar after it has first been used and exposed to air. This is a tricky business; many of the two-part synthetic resins and rubber molding compounds have a shelf life guaranteed from three to six months. This will vary with the product, although the life can often be extended for a few months by storing the adhesives in a refrigerator.

There would be less of a problem if all the containers were date-stamped, or if one could buy small amounts directly from the maker. But one usually buys from a local merchant; and there is no way of knowing how long the product has been on his shelf. Buy as small amounts as are consistent with your anticipated needs over the next few months. Then write on the container the month and year you purchased it. At least you will know how long it's been on your shelf.

Test the adhesive for setting-up time each time before you use it on an artifact. Some of the amino-resin adhesives that have become too old will simply make a gritty, watery curd which can be washed or wiped off the object again. But—when your two-part epoxy or polyester resins become old, all sorts of interesting but unpleasant things can happen. They may remain sticky and not set up at all, in which case you have an almost hopeless job of removing the substance again, especially from porous surfaces. On the other hand, I have also had the experience of old batches setting up *solid* during the mixing process. Think what this would mean if you had two adhesive-covered surfaces only half-positioned together at the time the resin set up! For practical purposes removal of a hardened two-part resin is almost impossible without great danger to the object. So beware—test your adhesives on trial bits of material first!

ADHESIVE SUBSTANCES THAT CAN CAUSE TROUBLE

Pressure-Sensitive Cellulose Tape. This type of tape is most familiarly known as "Scotch" tape, a name which correctly applies to only one of several tapes manufactured by 3M Company. The ordinary brand of cellulose tapes one buys at dime stores and hardware stores degrades in storage or in use, bonds poorly over a long period of time, and often leaves permanent stains on paper. There are transparent mending tapes which are considered safe for paper, and these are available from library supply companies.

Pressure-Sensitive Laminating Film. This resembles cellulose tape in appearance, but comes in sheets or wide rolls, and is highly touted (by the makers) for preserving "valuable documents, drivers' licenses, cherished photos, etc." Personal experiments with these materials have convinced me that they would be disastrous on valuable items. The films degraded in a few months of storage, stuck only partially to the objects to be laminated, and were far more difficult to remove with solvents than even common cellulose tape. (See pp. 67-8.)

Dry-Mounting Tissue. Either wax- or shellac-based, these are used with heat and pressure to mount documents and photographs. When used with a proper dry-mounting press these tissues are useful for mounting photographs or labels for exhibitions. But, because they can sometimes stain or become difficult to remove safely, dry-mounting tissues are *not* recommended for mounting original prints and documents. Confine their use to temporary mounting of duplicatable exhibition materials.

Rubber Cement. This adhesive should not be given houseroom. It stains paper quite badly and often permanently; and even though its adhesive quite commonly fails in use, the part you wish to remove is almost impossible to dissolve. It is not even recommended for exhibition use, and definitely not in the field of conservation.

Spray-Can Adhesives. These are used on one or both surfaces of materials to be mounted, depending on whether a temporary or permanent job is desired. When the adhesive is dry the two pieces are put together. As with contact cements the positioning must be exact, because once stuck together the pieces cannot be wiggled around. Often rubber-based, these adhesives in spray-can form also seem to suffer from the same defects as old-fashioned rubber cement: sometimes they hold like fury; other times they fail. They may possibly be useful for exhibition work, but not for conservation.

Contact Cement. These are also related to rubber cements and spray-can adhesives in that they all presumably have a latex base. Since they all may have sulphur in them, these adhesives should not be used in exhibition areas where there may be lead or silver artifacts which can be adversely affected.

Library Paste. The commercial varieties have preservatives which are acidic and should not be used for paper conservation, as the paper will become degraded as a result. Neutral wheat pastes can be purchased from TALAS. Technical Library Service.

Commercial Liquid Animal Hide Glues. These are easier to use than the home made ones; but it is their only advantage. They are inferior in strength to the ones you prepare yourself.

ADHESIVES USEFUL IN THE FIELD OF CONSERVATION

Wheat or Rye Paste. Such neutral starch pastes are dry powders mixed with water. Some are ready-cooked, and some need to be boiled first. They are safer than commercial pastes, but make them in small amounts, for they will not keep so long. They are useful for paper and cardboard because they hold well but can still be safely removed if desired. They are not strong enough for wood or metal.

Filler Compounds. There are many of these on the market. The traditional ones like gesso, spachtle (spackle), putty, and wood fillers are made of inert materials like whiting, plaster, or wood dust, plus an adhesive. These are all useful for filling holes and cracks or for building up missing areas, and they adhere well to clean surfaces. They generally have little bonding strength, however, and are not a substitute for adhesives. Some of the newer fillers, usually two-part resins plus metal powder or fiberglass fillers, do have bonding strength, but they are considerably more expensive. Plan in advance which type you need.

Mastics and caulking compounds act as fillers and adhesives, and are particularly useful when nonporous materials like glass and metal are to be joined. If there are irregularities in the two surfaces, the mastic will fill in to give a more complete holding surface. Caulking mastics also give you the opportunity to wiggle or position the objects into place, a distinct advantage over contact cements. But some of these compounds contain sulphur, and some are difficult to remove once dry. Check the instructions before using them, and experiment.

Animal Glues. Included in this category are fish glue, rabbit-skin glue, gelatin, and hide glue (carpenter's glue)—all traditional glues and still useful. Gelatin by itself or mixed into gesso is still used in fine arts conservation. While ready-made liquid glue is available, ground hide glue is the better material for serious cabinetwork. It is more trouble because the dry glue must be soaked first, then heated, and used while still hot; but this nuisance is more than offset by the fact that it is far stronger than ready-made glue, and unlike some other adhesives it will not stain wood. Where you have tight-fitting joints and the object is not subjected to high moisture, hot hide glue is still among the best and cheapest adhesives.

White Glues (water-resin emulsions). These are among the handiest of the newer adhesives which have come on the market since World War II. They are useful for a variety of porous materials, available everywhere, and reasonably inexpensive. They are nontoxic to the skin, can be thinned with water if desired, and give a good bond. But they should not be used where they will be subjected to steam or high moisture conditions, nor with paper artifacts because of their presumed acidity, nor with metal which they will corrode. White glue is an easily applied and relatively satisfactory adhesive in situations where you might use carpenter's glue but do not want to take the time to prepare it. However, once white glues have dried they are no longer water soluble; usually a mixture of water plus acetone will be necessary to dissolve the bond. Be sure that the object you glue will not be affected by this mixture if disassembly should be necessary.

Clear Adhesives of Soluble Resins. This includes an enormous number of adhesives, most of which are labeled as "all-purpose, mends anything." Generally it is a resin in a quick-evaporating solvent ("Duco" cement is an example). The solid component may be a cellulose product, a vinyl-or acrylic-resin, soluble nylon, etc. Such adhesives are all theoretically capable of being redissolved in their original solvents, although exceptions may occur under certain circumstances. Although neither as strong nor as permanent as two-part resins, they are quite useful for mending pottery or glass since the adhesive can be removed in the event of a poor fit. As a rule, soluble resin adhesives should not be used on large areas because their solvents usually evaporate so quickly that part of the adhesive will be dry before the whole area has been covered. However, in situations where you cannot tie or clamp the pieces together and must hold them by hand, the rapid drying is an advantage. These adhesives are not recommended for fastening together two pieces of nonporous materials of any appreciable surface because the entrapped solvent will cause a weak bond. Remember when using these adhesives that the solvents in most of them are toxic and or explosive, so take precautions to have ventilation and to allow no naked flames or lit cigarettes.

Melted Waxes and Resins. Stick shellac, beeswax, and various natural resin-wax mixtures have been used for centuries as mending materials, and along with newer synthetic resins and waxes they are still valuable in the conservation field today. Because of the variety of formulae and materials now available, one who wishes to keep up with this field should subscribe to the publications of the International Institute for Conservation of Historic and Artistic Works, which from time to time give reports of experiments in the use of these materials.

Two-Part Synthetic Resins. Typified by resorcinol, epoxy or polyester, these are strong, waterproof permanent adhesives, consisting of a resin plus a hardener and/or catalyst. They can be compounded in an endless number of ways. Since most adhesives of this class cannot be dissolved once they have set, be sure that the pieces to be mended will *never* need to be taken apart again. Think twice.

These resins may be as thin as water so that they can be soaked into dry-rotted wood in ship bilges or into worm-riddled sculpture, or they may be the consistency of syrup, paste, or putty. Some are formulated to remain hard at elevated temperatures; others are made to be flexible at below-freezing levels. A variant of two-part resins is the type in which both materials are pre-mixed in powder form and the user simply adds the proper amount of water and stirs. These have a longer shelf life (one to two years) than most two-part liquid resins, are stronger than white glues, and more moisture resistant. They are usually sold under the general name of "plastic resin glues."

The foregoing is an indication of the varied types of adhesives that are available. Remember: there is no one all-purpose adhesive, even with the newer so-called "miracle glues." The proper adhesive—one that will resist a specified temperature, physical stress, chemical, or solvent action—does exist; and you can find it *if* you spell out your needs to the manufacturers, rather than merely grabbing the nearest "all-purpose" adhesive off your dealer's shelf.

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It is a sound idea to keep a record of how various adhesives worked (or failed) for you under certain circumstances. So many of these products may be used in different ways according to the amount of solvent in them or the manner in which they are used—as a protective coating or varnish, as a filler, an adhesive, or a combination. But no adhesive does its best when applied to surfaces that are dirty, dusty, oily, or corroded. A *clean*, roughened surface is usually essential, plus pressure or clamping to hold the pieces immobile until the adhesive is dry. One last word: do be aware that there are new brand names on the market every month; and that even old brands may change their formulation—sometimes for better or sometimes for worse for your particular problem. Make a point of testing new adhesives before using them on valued pieces.

SUGGESTED READING

Synthetic Materials Used In the Conservation of Cultural Property. International Centre for the Study of the Preservation and the Restoration of Cultural Property, 256 Via Cavour, Rome, Italy, 1963.
A description of various new synthetic resins and other materials used

as varnishes, adhesives, etc. In addition to giving the scientific name of a product, it also gives the trade names and sources of supply in the U.S. and Europe.

Boustead, W. "Conservation of Australian Aboriginal Bark Paintings." *Studies in Conservation* 10 (November, 1966).

Gorton, E. "Restoration of an 18th Century Writing Table." *Studies in Conservation* 6 (February, 1961).

Kostrov and Sheinina. "Restoration of Monumental Painting on Loess Plaster Using Synthetic Resins." *Studies in Conservation* 6 (August, 1961).

Kozlowski, R. "An Apparatus for Glueing Split Panels." *Studies in Conservation* 7 (November, 1962).

Sekino, M. "Restoration of the Great Buddha Statue at Kamakura." *Studies in Conservation* 10 (May, 1965).

The five references listed above represent a cross-section of articles on the application of adhesives to be found in *Studies in Conservation*. If, as a non-member you wish individual issues, address inquiries to: IIC, 608 Grand Bldgs., Trafalgar Square, London, WC2N, 5HN, England.

Gettens and Stout. *Painting Materials, A Short Encyclopedia*. New York: Dover Publications, 1966.

Contains among other information a large and useful section on adhesives, their nature and use. At $2.00 this book is a "must" which any student of conservation can afford.

Macbeth and Strohlein. "The Use of Adhesives in Museums." *Museum News* (May, 1965). Technical Supplement #7.

A definition of various adhesives, plus some specific formulae.

Plenderleith, Harold J. *The Conservation of Antiquities and Works of Art*. New York: Oxford University Press, 1956.

Handbook of Organic Industrial Solvents. Chicago: National Association of Mutual Casualty Companies, 20 North Wacker Drive, 1958.

A list of solvents, some of which you may use in conservation, and their toxicity and flammability ratings.

Excerpts from The Preservation of Library Materials: A CUL Handbook: Buidelines and Procedures. (New York: Columbia University Libraries. Preservation Department, 1985)

2.1 GENERAL GUIDELINES

2.1.1 FIRST-TIME BINDING

Unbound materials which are used with any frequency will have a relatively short shelf-life, and thus it is important that every item intended for retention in the collection be bound at the earliest practical moment. Serial or monographic volumes needing first-time binding should be sent to a commercial binder. However, not all unbound materials entering the collection are new or have paper strong enough for commercial binding. Test the strength of the paper by folding an inconspicuous corner back and forth 3 times; if it breaks before the third fold, the paper is too brittle for binding and the item should be boxed or replaced. Fragile and borderline brittle materials may be rebindable by the In-house Bindery.

2.1.1.1 Serials - When to Bind

In the case of serial publications which are kept permanently in hard copy (i.e., retained when no longer "current" and not replaced with microform backfiles), bind as soon as a bindable volume has been received. A "bindable volume" usually consists of the issues for a particular numbered volume or year, though some may have to be either divided or combined on the basis of size. The rule of thumb is: bind when you have a logical grouping of consecutive issues 1 to 2 inches thick. Materials which are in heavy demand when first received should not be removed for binding, or should be "Rush" bound; and academic schedules must also be taken into account. But the longer serial issues remain unbound, the greater the probability of damage and loss.

2.1.1.2 Monographs & Series - When to Bind

Monographs and monographic series volumes which arrive unbound should be bound before they are made available for use, with two exceptions:

-- Items which will not be kept permanently (e.g. multiple copies purchased for reserve use for a single academic year) may not be worth binding. If one or more are to be kept permanently, those copies should be bound at once; and if heavy reserve use is anticipated, it may be cheaper to bind all copies than to replace them as they wear out.

-- Items which are urgently needed for immediate curriculum support may be made available temporarily in paperback, but should be retrieved and bound as soon as the immediate demand is past.

2.0 SELECTING THE APPROPRIATE TREATMENT

The long-term usability and life-expectancy of book materials in any library collection depend a great deal on the type of binding first put around that material, and the physical treatment subsequently provided when the original binding becomes worn or broken. The range of alternatives for binding, rebinding, repair and sophisticated conservation treatment is great, and the costs involved in both the work itself and the necessary pre- and post-treatment processing vary from a few dollars to hundreds or even thousands for very special materials.

Practical decisions about what treatment is best for a given item involve weighing three factors:
-- the actual alternatives available and appropriate, given the physical condition of the item and its probable use;
-- comparative cost figures for the alternatives;
-- the value of the item within the collection as a whole.

The treatment decision must be a kind of acquisitions decision, and the key question is: It will cost the Libraries X dollars to restore this item to usable condition; if we did not already have it, would we spend those X dollars to buy it now? In some cases, this may be a very difficult decision. But, when deterioration threatens hundreds of thousands of volumes with utter extinction, the decision to treat one item inevitably becomes a decision NOT to treat some other, and hard choices must be made.

This section of the Handbook offers technical information about available physical treatment alternatives, guidelines for determining which alternatives are suitable for a given item, and basic cost figures. With this information, collection development and public service staff will be able to decide what should be treated and how it should be treated. The Preservation Department is ready to provide additional technical information, advice and consultation; but the final decision cannot be based on technical factors alone.

Each library unit should have two ongoing routines, one for preparing materials (chiefly serials) for first-time binding; and the other for identifying previously-bound materials in need of rebinding or repair. Actual procedures may vary greatly owing to differences in size of collections and staff, and in the types of materials found in each unit. But the following guidelines are generally adaptable.

2.1.2 REBINDING, BOXING, AND REPLACEMENT

2.1.2.1 Identifying Materials Needing Treatment

Damage to bound volumes resulting from heavy use, misuse, or chemical deterioration may be identified at several points: when materials are ready for cataloging; when gifts are accepted; when materials circulate; when materials are added to or removed from reserve or reference collections; when adjacent materials are shelved; when patrons point out damage; and when shelf-reading, cleaning, or shifting is done. Each library unit has a responsibility to establish a routine for the review of its materials and the determination of appropriate treatment for damaged items identified in the course of any of these activities.

The design of the identification and review process should be tailored to local conditions, but it will in most cases be useful to have:

-- A shelving area set aside, away from open stacks, where damaged materials can be placed for review.

-- One or more persons with designated responsibility for reviewing the materials, deciding on treatment, and forwarding them appropriately on a timely basis.

-- Provisions for restricting from uncontrolled use those materials in such poor condition that they are not likely to survive circulation or photocopying.

How "damaged" an item should be to be set aside for review and treatment will depend in part on local conditions: if thousands of volumes are falling to bits it is impractical to move them all from the open stacks, but those being used regularly should be treated. Priority for treatment must be decided by weighing both condition and probable use: prompt rebinding of an item in heavy demand may prevent further damage, while deteriorated but seldom used items may be given lower priority.

2.1.2.2 Review Process & Treatment Selection

Deteriorated materials that have been set aside should be reviewed considering three primary variables: the importance of the material to the collection; physical condition (bindable or unbindable); and probable use of the material. First, a decision should be made as to whether the material is important to retain in the collection. Material no longer needed should be withdrawn without any treatment. For example, duplicate copies in poor condition and titles that have been superseded by later editions may be discarded. After the initial weeding process, important material to be retained in the permanent collection should be evaluated in terms of condition and use patterns. The conclusions drawn from weighing these factors will dictate appropriate treatment options.

A. In general, commercial or in-house rebinding is the proper treatment for material that is important to the collection and is bindable. Because binding will extend the useful life of the item, and is economical, it is the recommended long-term treatment option. Little time is required to make this decision. As a preventive measure, the earlier the volume is rebound, the greater the likelihood that the textblock will remain intact. Without its protective cover, a volume will deteriorate quickly.

As a guideline, volumes that have damaged covers (torn spine, loose or detached covers) but have flexible paper, should be sent for commercial rebinding. Materials that are fragile, have special features, or have borderline brittle paper, provided the sewing and textblock remain intact, should be sent for in-house rebinding. In-house, the binding process is done primarily by hand rather than by machine and assembly line methods more common in commercial library binderies. The In-house Bindery also performs some types of paper repair.

The determination of a volume's bindability can be done effectively by most staff members with a training session from the Preservation Department and some experience. Once the system is established in the library unit, with guidelines understood and uniformly applied by the staff, it may be necessary for a selection officer to review only problem items. More consistency in the selection of treatments will be accomplished if one staff member is responsible for evaluation of condition.

B. Materials that are deemed necessary to the collection but are not bindable (i.e., do not pass the three-fold test) may be boxed and their use restricted. Materials can also be boxed if they are not important enough to be replaced, but too valuable to withdraw.

The intellectual content of an unbindable item can be preserved by replacement in hard copy or microform. Replacements are available from publishers, or they can be reproduced in photocopy or microform by CUL Reprographic Services, by other libraries, or outside services. See Section 4.1 for a description of replacement options.

2.2 CHOOSING A SPECIFIC PHYSICAL TREATMENT

A complex array of factors enters into the choice of the most appropriate treatment for a particular item. Size, condition of paper, width of margins, and probable use are just a few of the characteristics of a volume which must be taken into account.

This section offers three approaches to understanding the options and making the best treatment choices. Section 2.2.1 describes in detail the specifications for each treatment and the materials for which it is best suited. Section 2.2.2 describes special considerations for treatment. Section 2.2.3 serves as a quick reference guide to recommended treatments for common types of materials.

All staff responsible for making treatment decisions should study each section carefully. Once the staff acquires a working knowledge of this material, Section 2.2.3 will serve as a usable reference guide, requiring only occasional reference to the detailed treatment specifications.

2.2.1 TREATMENTS

This section contains detailed specifications for all the treatments available from commercial and in-house binders. Material sent for any of the following treatments must be accompanied by a binding slip.

CONSERVATION CORRESPONDENCE

ILLINOIS COOPERATIVE CONSERVATION PROGRAM

Number 4 September 1984

A SIMPLE WORKSTATION FOR THE CONSERVATION OF LIBRARY MATERIALS

Having the right tools at hand and an appropriate place to work enhances the efficiency of a conservation effort. Time spent gathering supplies and tools and clearing a spot at which to work can turn a procedure, otherwise quickly accomplished, into an exercise in frustration. It is preferable to have a place set aside that is used only for conservation and is always ready to go.

The first step in designing a work station is to determine what procedures are to be done based on the nature of the collection and the type of use it receives. For example, a public library with few rare materials and a large percentage of circulating material should probably concentrate on simple repair and maintenance techniques in order to keep materials in usable condition for as long as they are needed. A historical society library would more appropriately focus on archival procedures such as polyester film encapsulation and protective encasement to stabilize the condition of their holdings. Rare or valuable materials should not be worked on more extensively, except by a professional conservator.

A simple work station of the type described below would be suitable for many routine conservation procedures, such as repair of case-bound books, the construction of simple protective enclosures, and the mending or encapsulation of maps or manuscripts.

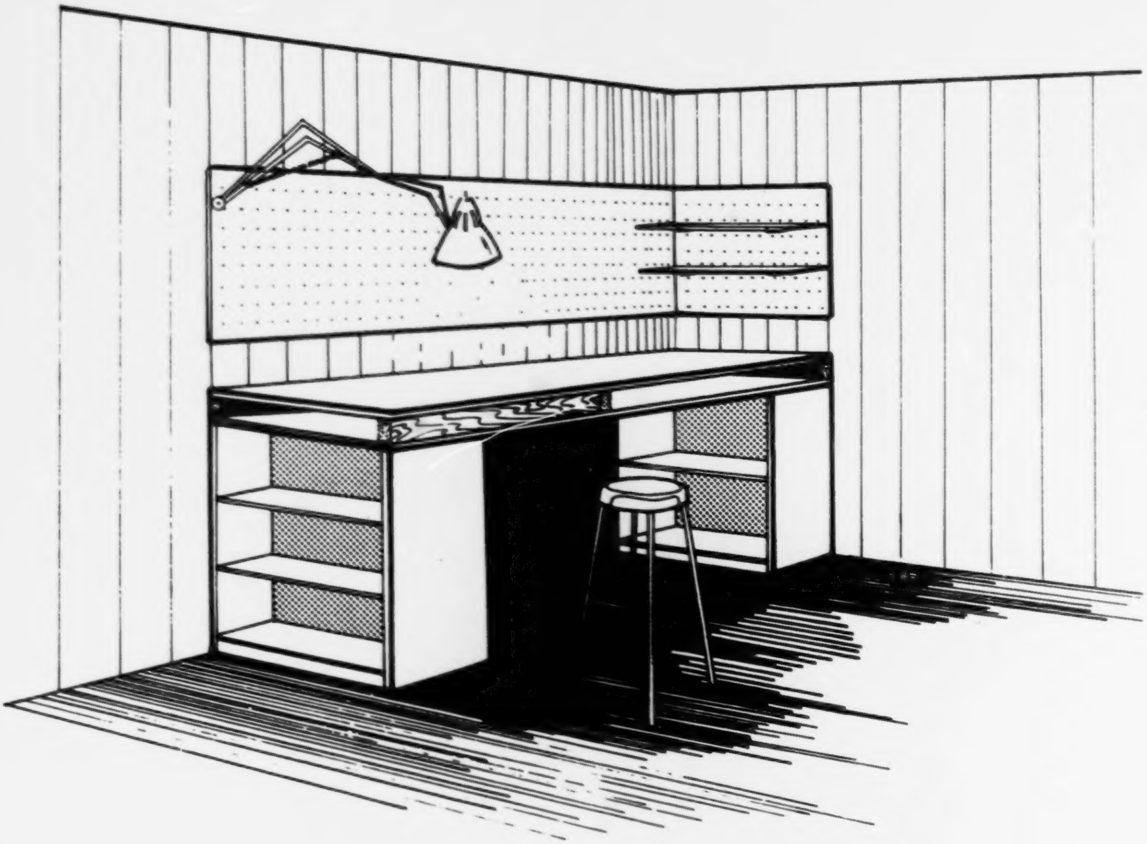
EQUIPMENT

WORK STATION including BENCH AND STORAGE

Although any large table is adequate, a better use of the same floor space would be to have a unit which also provides storage space for tools and supplies, keeps them close at hand, and allows the work surface to be kept free. There are many possibilities for the design of such a unit. The three main requirements are 1] sturdy and stable construction, 2] a sizable, flat, washable surface such as Formica or polyurethane-coated wood and 3] provisions for storage of small tools and supplies. A system of cubbyholes and shelves under the surface and pegboard mounted on the wall would help to keep things organized.

Specifications for height are an individual matter. The work surface should be high enough to work at comfortably while standing. Depending on the worker's height, this is usually somewhere between 35-38 inches. Some procedures may be done while sitting, so an adjustable stool, 23-26 inches high, should be provided.

The work station illustrated on the following page has a flexible design, is easily adaptable to a library's needs, and requires little carpentry.



MATERIALS:

2--4' x 8' sheets of 3/4" finish grade plywood
4--2" x 4", cut in lengths of 6', 3', 22-1/2", 22-1/2"

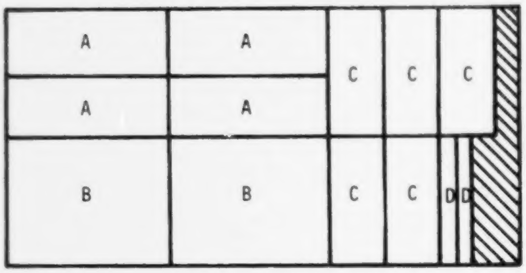
This workstation is built to a height of 35 inches. The height can be adjusted by varying the height of the back panels and uprights from 30 inches (the additional 5 inches is the counter.)

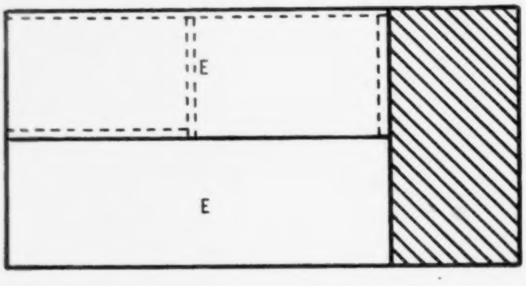
The plywood is cut according to the diagram at right.

The bottom shelf is raised off the floor 3 inches and the area below the shelf is then boxed in with the kick boards.

The dashed line in the drawing denotes the placement of the 2 x 4's between the counter top and bottom, creating a paper storage area.

A--Uprights for shelves, 12" x 30"
B--Back panel for shelves, 24" x 30"
C--Shelves, 11" x 24"
D--Kick boards. 3" x 24"
E--Counter top and bottom, 24" x 72"
:::: Placement of 2 x 4's





Some other ways to create a work station:

High-impact plastic milk cartons or decorator cubes (open at one end) can be stacked as supports for a table top.

Two small utility shelves can support a table top. Extra storage room can be made by running boards from shelf to shelf across the back.

Or construct the workbench from sheets of 3/4" plywood. The Small Bindery by Jane Greenfield (New Haven, CT: Yale University Libraries, 1981; Preservation Pamphlet No. 5) contains a sample plan and is available from the Preservation Department.

PAPER CUTTER

Although it is quite possible to cut materials with a sharp knife and a metal ruler, it is slow, tiring and exacting work. A paper cutter is really just a huge pair of scissors, designed to cut one thickness at a time for maximum accuracy. An ordinary table model with a flat gridded base board and a curved, hinged blade is acceptable. Even better would be a floor model with a foot operated clamp. Paper cutters commonly come in sizes from 14-36 inches, the larger sizes being much more useful. A board shear is a larger version of the paper cutter, but more powerful and precise.

The paper cutter should be kept on a separate table near the work station.

ADJUSTABLE-ARM WORK LAMP

Ordinary room lights and window light are seldom strong or concentrated enough for detail work. A work lamp solves this problem. Such lamps often come with an adjustable arm and a variable mount so that they can be attached to either the wall or table top.

ACCESS TO RUNNING WATER

Water is needed to clean hands and tools and to mix glue and paste. It is not absolutely necessary that the water source be in the same room - nearby is good enough. A jar of water is kept on the workbench so that brushes can be soaked and drips mopped up.

METAL-EDGED PRESSING BOARDS

It is desirable to press newly repaired books to keep the glued parts in close contact while they dry. Additionally, this step is helpful in defining the hinge groove after repair.

Brass- or aluminum-edged boards are made by attaching a 3/8" metal strip, centered from top to bottom, along one edge of 1/4" plywood. The 1/16" metal lip formed above and below fits into the hinge area of a book. In this way, several books may be pressed at a time, either in a book press or weighted down with bricks wrapped in Kraft paper.

Another way to press books is to place catalog card drawer rods or metal knitting needles into the grooves formed by the hinges, then put a plain board on top and a weight.

ADDITIONAL OR OPTIONAL EQUIPMENT

BOOK PRESS

A press is an efficient way to secure the book structure while repairs dry. A commercial press can be purchased which will accommodate several volumes at a time, the actual number being determined by the opening, or "daylight". Sometimes a library has a press hidden away. If this is the case, unearth it, clean it up and use it! It will make your life easier. An old-fashioned letter press can be adapted for use as a book press by inserting longer bars into the uprights.

LARGE PIECE OF 1/4" GLASS

Glass is a suitable work surface for polyester film encapsulation of flat documents. The surface is easy to clean, film will cling to it by static electricity, and it can be cut on directly with knives as the surface will not scratch (although knife blades do get dull faster). A 30" X 36" piece is usually big enough.

If a lot of encapsulation is to be done on a continuing basis, the glass can be put on a table of its own and mount the polyester film roll on a dowel rod along one edge.. The film can then be pulled out, measured, cut, and used all in the same place.

CUTTING BOARD

A self-sealing mat does not warp or crack and provides a non-slip cutting surface with measuring lines.

BOXBOARD CRIMPER

The best conservation "treatment" for rare, valuable or fragile materials is to place them in a protective enclosure such as a box or portfolio to provide protection from dust, light, abrasion and atmospheric pollutants. A simple folder with four flaps can be made to exactly fit a specific book, thus allowing no movement within the box. The bends made in the boxboard are called "crimps". Many enclosures are constructed from laminated alkaline paperboard called "boxboard". Boxboard can be laboriously crimped by hand using a bone folder and a home-made crimping jig, but better crimps can be make more quickly by using a crimping machine. These simple machines have a bed which accomodates a sheet of boxboard no larger than 46", and a crimping bar operated by a foot treadle. Sometimes called a "Phase Box Maker".

Four-flap folders can also be constructed without a crimper from archival corrugated board. (see MATERIALS and SUPPLIES) The board is bent against a table edge and along the corrugations and fastened shut with Velcro®.

TOOLS

AWL

A stabbing tool used to pierce holes along the fold of a single-signature pamphlet prior to sewing it into a pamphlet binder. A biology probe or a potter's cut-off needle can be used instead of an awl.

BONE FOLDER

It resembles a smooth letter opener and made from bone or plastic. A bone folder is used to smooth glued surfaces and to crease or fold materials.

Two useful shapes are straight and pointed. The straight is best for working in the hinge area and for smoothing down flat paper and cloth; the pointed is best for scoring, crimping and working in tight spaces.

BRUSHES

Several types of brushes are needed for surface cleaning and for application of water and adhesives.

-Artist's oil or acrylic paint brush

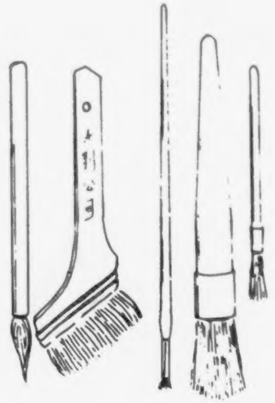
A narrow long-handled brush is used to apply small amounts of glue or paste to hard-to-reach areas, such as in tightening very loose hinges.

-Bookbinder's round glue brush

Designed for the efficient application of adhesives, these brushes have coarse natural brustles mounted into a ferrule. The advantage of using these special brushes is that they hold a lot of adhesive (so the brush does not have to be dipped very often) and they lay a smooth coat.

Any brush used with adhesives must by cleaned well after each session or the glue hardens in the base of the bristles, forming a "heel".

Have at least three sizes on hand: small (1/4"), medium (1/2"), large (1"). Natural bristle housepainting brushes can be used instead of round glue brushes.



-Dusting brush

A very soft brush, such as a draftsman's board brush or a Japanese utility brush, is used to brush away eraser crumbs or loose dirt when cleaning paper. Often, particularly if the paper is fragile, this is the only cleaning that is advisable.

-Oriental watercolor brush

A fine-haired pointed brush used in the preparation of Japanese paper mending strips by the water-tear method. Some conservators use a draftsman's ruling pen filled with water for the same purpose.

-paper cutter	Brodart; DEMCO; Dick Blick; Gaylord; Gane Grothers & Lane; University Products; American Printing Equipment & Supply Co.(for Vagelli BOARD SHEAR: BookMakers; for Jacques BOARD SHEAR: Nixen)
-adjustable-arm work lamp	Dick Blick; art supply stores; office supply stores
-metal-edged pressing boards	Gane Brothers & Lane; Basic Crafts; lumber yard and hardware store
-book press	Basic Crafts; BookMakers; Gaylord; Gane Brothers & Lane, available used
-boxboard crimper	("Phase Box Maker") Hollinger; (crimping jig) Pohlig Bros.
-corner rounder	(machine) Hollinger; Light Impressions; (U-gouge) Aiko's
-rivet setter + rivets	(machine) TRW-Carr Division; (hand-set) Art Handicrafts; fabric stores
-bookbinders's round glue brush	Basic Crafts; BookMakers; Gane Brothers & Lane; TALAS
-dusting brush	art supply stores; Aiko's; Light Impressions
-oriental watercolor brush	art supply stores; Aiko's
-small sharp scissors	Brookstone; fabric stores; surgical suppliers
-scalpel	BookMakers (X-Acto knives: art supply stores, craft stores)
-book repair knife	Brodart; DEMCO; (dull paring knife: discount stores)
-cork-backed metal ruler	Brodart; DEMCO; Gaylord; University Products; art supply stores; office supply stores
-bone folder	(real) BookMakers; Light Impressions; TALAS; Gane Brothers & Lane; Basic Crafts; (plastic) Brodart; DEMCO; Gaylord; University Products
-microspatula	BookMakers; Fisher Scientific
-awl	Art Handicrafts; Gane Brothers & Lane; craft shops; hardware stores
-metal T-square, metal or plastic triangle, and metal L-square	art supply stores; hardware stores; Art Handicrafts
-tiny whisk	gourmet shops; kitchen shops
-polyvinyl acetate adhesive (PVA)	Aabbitt Adhesives; Aiko's; TALAS; (Magic Mend: Gaylord)
-starch paste, methylcellulose	Aiko's; BookMakers; Light Impressions; TALAS, Process Materials
-#415 Scotch Brand double-sided tape	Light Impressions; University Products; Hollinger; TALAS; Conservation Resources
-Archival Aid Document Repair tape (Ademco)	Light Impressions; University Products
-endsheets (these are suitable; other choices are possible)	
-(for Mohawk Superfine Text)	Andrews/Nelson/Whitehead; BookMakers
-(for Archivart Laid Endleaf)	Process Materials Corporation
-(for Alphacellulose Paper and Perma-Dur Ledger)	University Products
-(for Permalife 80 lb.)	TALAS
-boxboard	Conservation Resources; Hollinger; Light Impressions, University Products
-bristol	Hollinger; art supply stores; Process Materials; University Products
-pressboard	Gane Brothers & Lane; University Products
-corrugated board	process Materials; Light Impressions, University Products
-Japanese papers	Aiko's; Light Impressions; Andrews/Nelson/Whitehead; University Products
-polyester film	Hollinger; light Impressions; University Products; Conservation Resources
-envelopes	Conservation Resources; Hollinger; University Products; Light Impressions
-interleaving paper	Conservation Resources; Hollinger; University Products; Light Impressions
-blotting paper	BookMakers; Process Materials Corp.; Light Impressions; University Products; photo supply stores
-bookcloth and buckram	BookMakers; Gane Brothers & Lane; Holliston Mills; Joanna Western Mills; Andrews/Nelson/Whitehead
-super	Gane Brothers & Lane (hinge cloth); fabric stores
-grosgrain ribbon	fabric stores or wholesale supplier
-linen thread and a long, strong needle	Art Handicrafts; Basic Crafts; Gane Brothers & Lane; University Products
-rivets	TRW-Carr Division
-plastic washers	Conservation Resources

SUPPLIERS

Aabbitt Adhesives
2403 North Oakley
Chicago, IL 60647
(312) 227-2700

Aiko's
714 N. Wabash Avenue
Chicago, IL 60611
(312) 943-0745

American Printing Equipment
And Supply Co.
42-25 Ninth St.
Long Island City, NY 11101
(212) 729-5779

Andrews/Nelson/Whitehead (A/N/W)
31-10 48th Avenue
Long Island City, NY 11101
(212) 937-7100 [$100 minimum]

Art Handicrafts Co.
3512 Flatlands Avenue
Brooklyn, NY 11234
(212) 252-6622

Basic Crafts Co.
1201 Broadway
New York, NY 10001
(212) 679-3516

BookMakers
2025 Eye Street, N.W., Room 412
Washington, D.C. 20006
(202) 296-6613 [$25 minimum]

Boye Needle Company
4343 N. Ravenswood
Chicago, IL 60613
(312) 472-0354

Brodart, Eastern Division
P.O. Box 3037
1609 Memorial Avenue
Williamsport, PA 17705
(800) 233-8467 [no minimum]

Brookstone Company
127 Vose Farm Road
Peterborough, NH 03458
(603) 942-9511 [no minimum]

Conservation Resources
International Inc.
1111 North Royal Street
Alexandria, VA 22314
(703) 549-6610

DEMCO
Box 7488
Madison, WI 53707
(800) 356-8394 [no minimum]

Dick Blick Company
Box 1267
Galesburg, IL 61401
(800) 447-8192 [no minimum]

Fisher Scientific Company
1241 Ambassador Blvd.
St. Louis, MO 63178-4989
(314) 991-2400

Gane Brothers & Lane, Inc.
Mail Order Catalog Division
1400 Greenleaf Avenue
Elk Grove Village, IL 60006
(312) 593-3360 [$10 minimum]

Gaylord Bros., Inc.
Box 4901
Syracuse, NY 13221
(800) 448-6160

The Hollinger Corporation
3810 South Four Mile Run Drive
P.O. Box 6185
Arlington, VA 22206
(703) 671-6600

Holliston Mills Corporation
P.O. Box 478
Kingsport, TN 37662
(800) 251-0251

Joanna Western Mills Company
220 Broad Street
Kingsport, TN 37660
(800) 251-7528 [no minimum]

Light Impressions Corporation
439 Monroe Avenue
P.O. Box 940
Rochester, NY 14603
(800) 828-6216 [no minimum]

Nixen
P.O. Box 261
Mystic, CT 06355
(203) 572-0241

Process Materials Corporation
301 Veterans Boulevard
Rutherford, NJ 07070
(201) 935-2900 [$40 minimum]

TALAS
213 West 35th Street
New York, NY 10001-1996
(212) 736-7744

TRW United Carr Supply
10544 West Lunt Avenue
Rosemont, IL 60018
(312) 296-7161

University Products, Inc.
P.O. Box 101, South Canal Street
Holyoke, MA 01041
(800) 628-1912

CUTTING TOOLS

-Scalpel or craft knife and blades

In many situations a sharp knife is more accurate and quicker to use than scissors. The blades are easy to change and may be re-sharpened on a piece of fine sandpaper. Craft knives such as X-Acto© are acceptable, but scalpels are sharper and easier to use. Straight blades are best for cutting and curved blades are used for paring and shaving off layers of paper.

-Dull paring knife or "book repair" knife

Used to scrape away loose paper layers (e.g. the old spine lining paper prior to preparing the text block for recasing).

-Embroidery scissors

Small sharp scissors (with approximately 1½" blades) used for making snips in cloth.

-Scissors and shears

The new lightweight type (such as Fiskars®) are particuliarly comfortable and precise. A suitable selection would be 7" to 9" scissors and large shears with bent blades (for quick work on large areas).

LIGHT WEIGHTS

Used to assure close contact between freshly glued or pasted surfaces. Also, to hold dry parts in place while they are being measured and assembled.

Some possibilities are: small beanbags filled with lead shot (line the inside of the bag with plastic to prevent lead dust from filtering through the cloth), baby-food jars filled with beans or pennies, and cubes of solid lead or pieces of thick cardboard glued together and covered (with paper).

-Small pieces of 1/4" glass with sanded edges

Another variant on light weights. Convenient, non-abrasive, easy to clean and transparent so that you can see what you are doing. Also, a good surface on which to "glue up" small things such as mending strips.

MICROSPATULA

A tool used by conservators to pry up layers of paper and cloth and to apply minute amounts of adhesive to otherwise inaccessible areas.

MEASURING TOOLS

Not all rulers are created equal. Some have thick or blurry calibrations which make it difficult to see where to make a mark. It only takes one or two tiny inaccuracies to throw all the measurements off by a significant amount. Make sure that all the rulers you buy have neat, precise calibrations.

-stainless steel ruler with cork backing

A cork-backed ruler greatly minimizes the chance of a ruler slipping while being cut or drawn against - saving both time and materials. The metal prevents a knife from cutting the ruler. It is best to have these in several lengths, such as 6", 12", 18" and 24".

-Yardstick

To measure bookcloth and to draw long lines.

METAL KNITTING NEEDLES

The perfect tool for applying glue into a loose hinge area on a case bound book. The needle is coated with thinned PVA (polyvinyl acetate adhesive) and inserted into the space created by the failure of the original adhesive (see CONSERVATION CORRESPONDENCE, number 2).

SANDPAPER with BLOCK or HOLDER

Fine sandpaper is used to level bumpy binder's board surfaces (e.g. the inside of a book cover boards after old endsheets have been removed, preparatory to replacing them). As when working with wood, it is more efficient to use sandpaper in a rigid holder.

SQUEEGEE

Used in polyester film encapsulation to force air out from between the layers of paper and film prior to final sealing of the package. It is best to have the rubber blade longer than 6 inches.

STAPLE REMOVER

To remove metal staples from pamphlets. A staple remover should never be used, however, when the paper is thin or fragile.

METAL T-SQUARE, METAL or PLASTIC TRIANGLE and METAL L-SQUARE

Books are (usually) rectangular. These tools are all aids in keeping things at right angles (90°).

TINY WHISK

Used to beat paste adhesives to make them smooth. A fork can be used.

MATERIALS AND SUPPLIES

ADHESIVES

Selection of an appropriate adhesive for each procedures and type of materials is crucial. Adhesives used in conservation should have a pH of 6-7 and be permanent (the color, chemical composition, flexibility and texture should not change with age). They should be unpalatable to insects and mold. Impermanent adhesives such as hide glue and rubber cement will deteriorate and are not used in conservation.

-Polyvinyl acetate adhesive (PVA)

A white, internally plasticized copolymer synthetic resin glue which dries clear or water-white. Easily diluted with water. strong and fast-drying. The preferred glue for situations where strength and flexibility are required. PVA is not easily reversible, however. It has a shelf life of about one year in a stable, cool environment and should never be allowed to freeze.

-Methylcellulose

A chemically inert substance which mixed with water forms a paste. May be used for mending paper or in 50/50 mixture with PVA for other applications. Dries more slowly than starch paste, but has a longer shelf life after it has been prepared. It is easily reversible in water.

-Starch paste

Starch is a polymer of glucose. Wheat and rice starch are compounded with water (like flour gravy) to form a paste adhesive. Some starch adhesives for bookbinding and conservation need to be "cooked" before use, while others are "instant". The dry powder has a long shelf life if kept cool and dry, but after mixing spoils quickly. Paste can be kept in a refrigerator to prolong its life. Like methylcellulose, starch paste can be used in mixture with PVA and is easily reversible in water.

-#415 Scotch Brand® double-sided tape

The ONLY tape which is recommended for use in sealing the edges of polyester film in the encapsulation procedures or joining the parts in some types of protective enclosures. The tape must never touch the document. Tested by the Library of Congress, this tape was proven to be chemically stable; it did not change color under accelerated aging conditions and the adhesive did not ooze from its original position.

-Archival Aid® Document Repair Tape (Ademco)

A very thin, acid-neutral pressure sensitive tape. It has a "slow-tack" adhesive which does not really grab the surface for a day or so. Not recommended for archival repairs, but convenient for ephemeral materials.

-#45 Velcro® Adhesive

A strong adhesive used exclusively to attach Velcro® fasteners without sewing. Sticky-Back Velcro© will not adhere permanently.

CLOTHS, RIBBONS and FASTENERS

-Bookcloth and buckram

Cloths used to cover books, portfolios and boxes. These are natural cotton which has been dyed, impregnated with starch (starch-filled) and processed with heat and pressure. "Bookcloth" is like muslin and "buckram" is like canvas. Library binders use pyroxylin- or acrylic-coated buckram which most people find to be both harder to work by hand and less aesthetically pleasing than starch-filled cloth.

-Super (also called crash or mull)

A thin, tightly woven, starch-filled bleached cotton cloth used in lining spines when "casing in" books or for some hinging techniques.

-Grosgrain ribbon

Cotton/polyester blend grosgrain ribbon (1/4" wide) can be used to tie up a book that has detached cover boards or a loose spine. Ribbon 1/8" wide can be used to reinforce headcaps during spine repair.

-Linen thread and a long, strong needle

Pamphlets may be sewn into binders instead of stapled. Also, linen thread in used to reattach loose signatures (see ONE LB. COFFEE CAN).

-Rivets, plastic washers, and waxed linen thread

The combination of metal rivets ("male" and "female" parts hammered together), plastic washers 1" in diameter, and waxed linen thread is used to hold protective enclosures closed.

-Velcro® fasteners

"Hook and loop" fasteners used to secure protective enclosures. Attached with #45 Velcro® adhesive. (see ADHESIVES)

CLEANERS

-Erasers

Erasers should be low-abrasion and should not deposit color on surfaces. Vinyl Magic Rub® erasers come in both blocks and peel-off pencils. Pink Pearl® and Art Gum® are also acceptable, but slightly more abrasive. For dry cleaning large dirty areas, Absorene® wall paper cleaner, Opaline® pounce bags, and One Wipe treated dust cloths can be used.

-One Wipe® treated dust cloths

Library of Congress has tested these cloths and found them safe. They may be washed repeatedly and still retain their effectiveness. Used for dry cleaning books and flat paper, and to keep polyester film free of debris during encapsulation.

PAPERS, BOARD, and FILM

For conservation purposes papers and boards should be acid-free or acid-neutral. Many also contain an alkaline buffer to enable them to resist acid attack from the environment. There is a popular misconception that 100% rag means acid-free - this is not true. Board is measured in thousandths of an inch (e.g. .052" thick), or plys (e.g. 2 ply, 4 ply) which refer to the number of thin layers glued together. Paper is often sold by weight per 1000 sheets (e.g. 60 lb., 80 lb.).

-Blotting paper

Thick, white unsized paper used to absorb moisture so that wet paper dries without cockling.

-Corrugated board

Constructed like ordinary corrugated board, available in either single- or double-wall, this light colored board can be bent against the edge of a table along the corrugations to make very simple protective enclosures. Not as durable as boxboard.

-Endsheet papers

Paper for endsheets is purchased in large sheets and then folded and cut to convenient sizes. The approximately sized endsheets are then trimmed to fit each individual book. 70-80 lb. paper is a suitable weight. Available in shades of white/cream/buff to match the color of various text blocks.

-Envelopes

Envelopes buffered to an alkaline pH are used for pamphlets and paper documents, whereas neutral pH (unbuffered) high alpha cellulose envelopes are more suitable for the storage of photographs. Many styles and sizes are available. The seamless style, or seams to the side, are preferable.

-Interleaving paper

A thin paper which is inserted between pages or documents to prevent acid migration and to protect from abrasion.

-Boxboard

An alkaline board (.040 - .060) used to construct protective enclosures, usually with the aid of a crimper. Usually gray/white or tan colored, and in differing qualities, sizes, and prices.

-Bristol

A lightweight alkaline (.006 - .020) board used for the construction of pockets, simple protective enclosures, and folders. Also called map folder stock. Available in acid-neutral or alkaline.

-Japanese papers

Strong, flexible handmade paper with long fibers. Most are acid-free. Used in mending torn paper, reinforcing hinges, and joining separate parts. Comes in many colors, textures, and weights - very thin and translucent to quite heavy.

-Kraft paper

Ordinary heavy brown wrapping paper used to protect work surfaces and to wrap bricks and other weights. NOT used in book repair or for other conservation purposes, although alkaline wrapping paper that looks like Kraft paper can be purchased from conservation suppliers.

-Polyester film

Clear, dimensionally stable, inert film used to encapsulate fragile, damaged or heavily-used documents. Available in sheets or rolls and most useful in 2 mil, 3 mil and 4 mil. Clear vinyl or cellulose acetate film should not be used because it is chemically impermanent.

-Pressboard

A dense, stiff board (.020 - .030) with a slick surface. Used to make pamphlet binders and covers for protective enclosures. The scraps make excellent surfaces on which to cut.

-Textured paper towels

To mop up with and squeeze water out of brushes.

-Waxed paper

Used as a moisture barrier while wet components dry. Waxed paper sheets used by commercial food services are particularly convenient because they interfold for dispensing.

MISCELLANEOUS

ONE LB. COFFEE CAN

To make a "sewing can": punch a small hole in the lid; put a spool of linen thread inside and close the lid, threading the end of the linen thread through the hole. Store awls and needles by punching them through the lid.

PLASTIC FOOD STORAGE CONTAINERS WITH AIR-TIGHT LIDS

For adhesive storage.

TALL THIN DISH DETERGENT BOTTLE

To hold PVA (when tightening book hinges with a PVA-coated knitting needle).

IN ADDITION

Hammer, saw, screwdrivers and pliers are very handy to have around... but not to use on the library materials!

CONSERVATION CORRESPONDENCE is issued by the Illinois Cooperative Conservation Program and focuses on specific topics relating to collection protection, maintenance, and repair. The series is available from the Illinois Cooperative Conservation Program, c/o Morris Library, Southern Illinois University at Carbondale, Carbondale, Illinois 62901. (618) 453-5122. ICCP is concerned with both the maintenance and repair of general circulating collections as well as the preservation of rare, unique, or local history materials. Specific information requests concerning the conservation of library materials are welcomed, and can be made to the Program office directly, or through one of the eighteen Illinois Library Systems.

Documenting Treatment

from HISTORY NEWS, February 1981. p.48.

CONSERVA-
TIPS
a
c
d
b
s
m

Conservation Records

BY JOHN T. POWELL

The conservator should maintain a written record, however brief, of the conservation procedures applied to each artifact in his or her care. Such a record serves several purposes. It is a valuable worksheet and guide for future operatives as they apply new procedures. The worksheet presents a valuable source of methodological data for laboratory assistants, curatorial staff, and other professional conservators desiring specific procedural information. Reference to this record serves as a monitor to the long-term stability of an object's condition after conservation. And, the worksheet offers a guide for curatorial and other staff members when the object leaves the laboratory en route to placement in an exhibit or storage area.

The value of the simple conservation worksheet and guidelines for its completion offered here will more than compensate for the time required for its preparation.

■ *Job number.* Record the job numbers in chronological order by project. In the laboratory, keep a master log that contains all worksheets in bound, seriated form. Keep copies of the worksheet in the accession files with the records of the objects involved, in the departments responsible for the objects, and possibly even with the objects themselves in storage.

■ *Accession number.* Record here the accession/catalogue number of the object for use in cross-referencing the object's conservation and registration records. This entry also serves as a record for reapplication of this number to the object if, for some reason, the number must be removed during the laboratory process.

■ *Department/division.* Record the name of the division in your institution responsible for the object's administration, such as "art," "ethnology," or "history."

■ *Location of object.* Where will the object be placed once conservation practices are completed? Where did it come from? Record this (for example, storage area A, shelf R-15). With this record you will know where to locate a particular object. In addition, later reference to such records may help to pinpoint problem areas in the museum resulting from a deficiency in an environmental control system. If several objects from the same area suffer similar deterioration, through these records the location of that problem area can be determined more easily.

■ *Description of object.* Record a physical description of the object, its material composition, or, in works of art, the media used, and its condition. Make a note if the object was archaeologically excavated. Include a statement telling why the object requires conservational attention.

■ *Description of applied methodology.* Vital to the value of the worksheet is a detailed description of materials and methods applied in an effort to address and treat the object. Include a complete and thorough outline of operations, materials, chemicals, solvents, and mechanism used, reactions, problems encountered, and other data pertaining to the conservation-consolidation process. Continue this information on the back of the worksheet if necessary.

■ *General comments and recommendations.* Here the conservator notes any discoveries made about the object or the procedures used while working with the object. Also use this space as an instruction section for other staff members, advising them on the proper recommended handling of the object—its administration, exhibition, storage, or general maintenance—to insure its future stability and proper care. Include under this heading information about any unusual or unexpected operations included in the methodological matrix, such as resilvering a small spot on a plated item, or other such conservation procedures.

■ *Project operatives.* Record the name or names of persons involved in the conservation of the object.

Complete the form by noting the date of the project's completion. The supervisory conservator then should sign his or her name in the space provided as a means of verification of the data on the sheet. Attach photographs, such as before and after illustrations of materials conserved or close-up photos of surface areas treated by conservation procedures, to the back side of the worksheet or on separate sheets. **HN**

John T. Powell serves as director of the Thomas E. McMillan Museum of Jefferson Davis College in Brewton, Alabama

Conservation Worksheet

Job number

Accession number

Object

Department/Division

Location of object

Description of object, its material construction, and condition

Description of applied conservation methodology

General comments and recommendations

Project operative(s)

Date **Signature, Conservator in charge**

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The Newberry Library Documentation Form

The importance of proper documentation and record keeping, including a complete photographic record, has long been recognized as an important aspect of painting and object conservation. Only in the past fifteen or so years has such a need been recognized in book conservation.

The documentation form may be broken down into four main categories. These are: identification, including description and "before" photography; specification; treatment; and finally billing and disposition. Due to the number of items dealt with annually, the importance of keeping all the information contained in a one page format is imperative in order to conserve filing space. The form itself is composed of three identical sheets interleaved with pencil sensitive carbons. The master or white sheet accompanies the object from photography through specification and treatment. After returning the object to the proper collection the white sheet is filed by call number as a permanent record of the work performed. The pink sheet is filed by call number as a means of inventory control while the object is in the lab. After billing the pink sheet is removed from the "work in lab binder" and filed by date. The blue sheet is kept by the collection originating the work for their records.

Several aspects of the form deserve special explanation. Of note is the fact that the form should be as complete as possible to induce the curatorial staff (or whomever initiates the work) to fill in as much information as possible about the importance of the item, its proposed storage format and any other interesting or otherwise important aspect of the object which might not be apparent to a conservator or technician. The specification section should include all the operations routinely done in the lab as well as leaving space for the inclusion of special instructions for those operations not specifically covered. We have found that two "check boxes" placed side by side, one for specifying and one for noting the work completed serve well for this purpose. A check box for "fragments in fragment file" alerts the reader that fragments such as sewing thread, end bands, end papers or binding fragments are shelved by call number in the conservation lab. In conjunction with this we have also printed a label to be adhered to the paste down of the back board signaling the reader that previous binding fragments are shelved in the conservation lab.

The verso of the sheet includes an area for the treatment report by the technician. An area for attaching the black and white 35mm. proof sheet strip, which is routinely taken of every object sent to the lab for treatment is also apparent. The negatives of these strips are systematically filed in the lab as well.

This form represents the fourth and latest generation of documentation forms in use by the Newberry Library. While it is as complete as possible at this time; it will inevitably give away to future generations in the years ahead.

May 1978
Jeff Rigby

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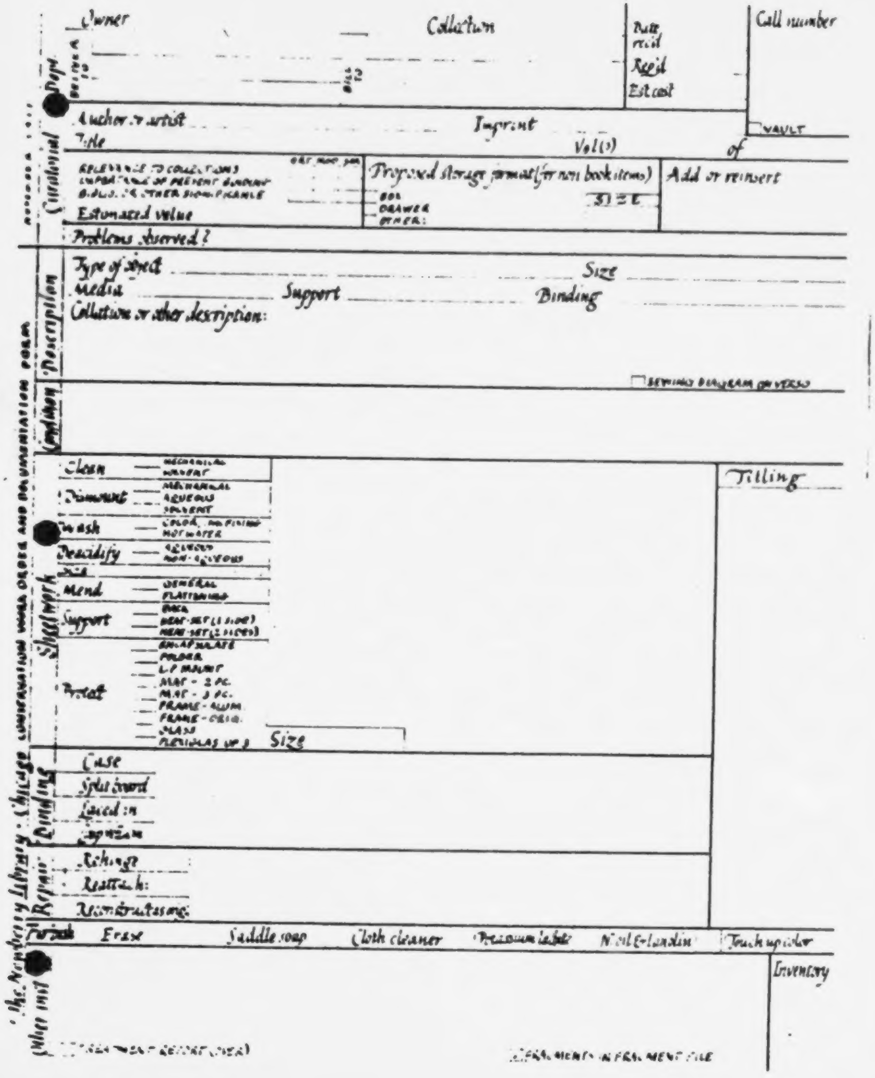


The Newberry Library · Chicago · CONSERVATION WORK ORDER AND DOCUMENTATION FORM

Dept.

Owner

Collection

DELIVER TO

BILL TO

Date rec'd

Req'd

Est cost

Call number

☐ VAULT

Curatorial

Author or artist

Imprint

Title

Vol(s)

of

RELEVANCE TO COLLECTIONS

IMPORTANCE OF PRESENT BINDING

BIBLIO. OR OTHER SIGNIFICANCE

Estimated value

Proposed storage format (for non book items)

BOX

DRAWER

OTHER:

SIZE

Add or reinsert

Problems observed?

Description

Type of object

Size

Media

Support

Binding

Collation or other description:

☐ SEWING DIAGRAM ON VERSO

Condition

Sheetwork

Clean — MECHANICAL, SOLVENT

Dismount — MECHANICAL, AQUEOUS, SOLVENT

Wash — COLOR, NO FIXING, HOT WATER

Deacidify — AQUEOUS, NON-AQUEOUS

Size

Mend — GENERAL, FLATTENING

Support — BACK, HEAT-SET (1 SIDE), HEAT-SET (2 SIDES)

Protect — ENCAPSULATE, FOLDER, L.P. MOUNT, MAT - 2 PC., MAT - 3 PC., FRAME - ALUM., FRAME - ORIG., GLASS, PLEXIGLAS UF 3

Size

Titling

Binding

Case

Split board

Laced in

Japanese

Repair

Rehinge

Reattach:

Reconstructing:

Finish

Erase

Saddle soap

Cloth cleaner

Pressure label

Neat's-foot oil & lanolin

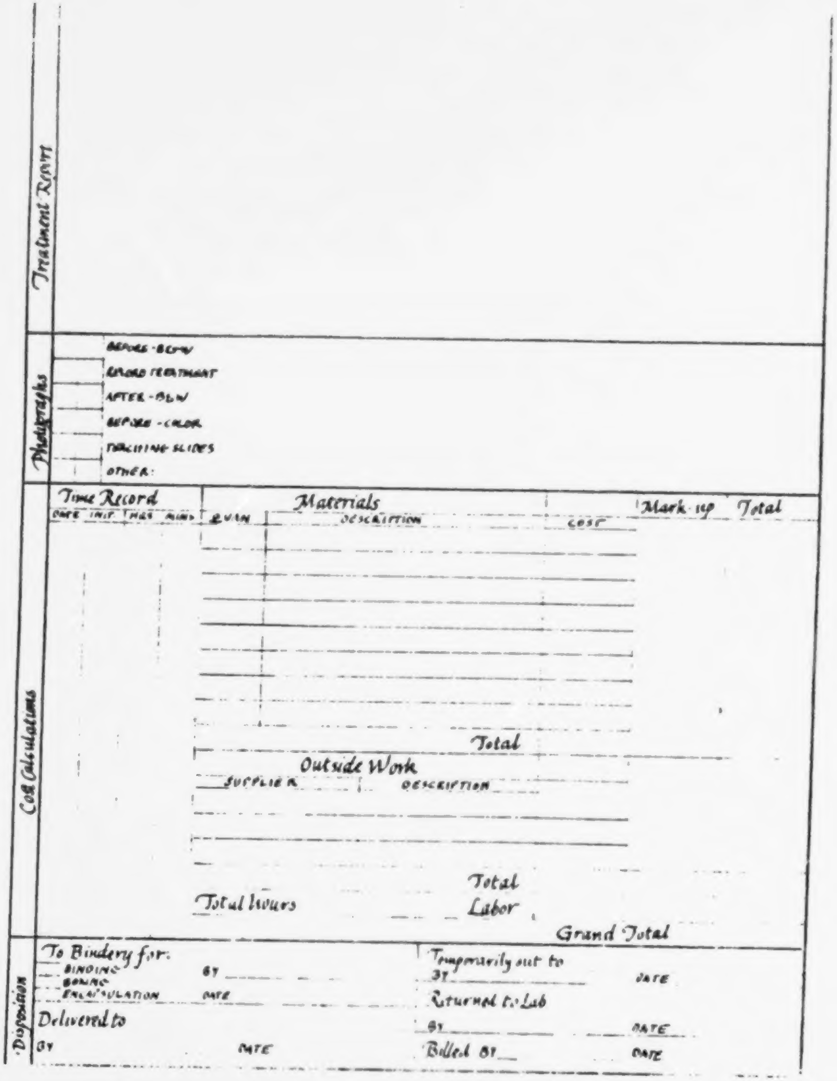
Touch up color

(Other instr.)

Inventory

☐ TREATMENT REPORT (OVER)

☐ FRAGMENTS IN FRAGMENT FILE



Treatment Report

Photographs

BEFORE - B&W

DURING TREATMENT

AFTER - B&W

BEFORE - COLOR

TRACING SLIDES

OTHER:

Cost Calculations

Time Record

DATE INIT. HRS. MINS.

Materials

QUAN. DESCRIPTION COST

Mark up

Total

Total

Outside Work

SUPPLIER DESCRIPTION

Total hours

Total Labor

Grand Total

Disposition

To Bindery for:

BINDING

BOXING

ENCAPSULATION

BY

DATE

Temporarily out to

BY

DATE

Returned to Lab

BY

DATE

Delivered to

BY

DATE

Billed BY

DATE

(State, city, building, title, architect) Record group______ Treatment No.______

Dimensions (cm.) H.__________ W.___________ thickness (mils)____________
(includes backing if present)

Paper Type: Watermark:

Medium:

Condition: Good Satisfactory Fair Poor

Surface dirt________________ Accretions________________ Abrasion________________
Tears________________ Holes________________ Missing parts________________
Folds________________ Creases________________ Bulges________________
Stains________________ Discoloration________________
Insect damage________________ Mold________________
Cloth backing________________ Laminated_____ Encapsulated__________ Deacidified_____
Other:

Recommended treatment: 1. None_________ 2. Minor________ 3. Major (to send out)_________

Treatment dates begun and completed:

Photography (date and type of shots):

Job #: ______________

The object below has been treated at the New England Document Conservation Center employing generally accepted and approved scientific and technical methods. Specific treatments are indicated below. Further work details are in the NEDCC files.

Object: ____.

PAPER TREATMENT

_____ Photographic record made; slides on file at NEDCC.
_____ Fumigated with ____.
_____ Collated (checked completeness, paginated, noted position of plates).
_____ Dry cleaned to remove surface grime.
_____ Disbound.
_____ Inks or colors, being water soluble, fixed to allow washing of pages.
_____ Washed in water.
_____ Alkalized (deacidified) with ________________________________.
    _____Aqueously   _____By immersion in bath
    _____Non-aqueously   _____By spraying
_____ Treated with organic solvents to remove or reduce tape and/or stains.
_____ Mended.
_____ Guarded.
_____ Leafcast.
_____ Reinforced with
    _____Japanese paper   _____Heat-set tissue

BINDING TREATMENT

_____ Rehinged covers with
    _____Leather   _____Cloth
_____ Repaired corners.
_____ Repaired endcaps.
_____ Recased.
_____ Rebacked.
_____ Resewn.
_____ Rebound in __________________________using a ___________________structure.
_____ Furbished with ____.
_____ Other: ____.

Storage of the material in an acid-free environment at 65 - 70°F and 50% relative humidity and protection from prolonged exposure to the ultra-violet radiation in natural and artificial light is desirable to maintain the integrity and durability of this material.

Date: ________________________ ____

New England Document Conservation Center
Abbot Hall - School Street
Andover, MA 01810

Client: ____________________________ Job #: _______________

The object below has been treated at the Northeast Document Conservation Center employing generally accepted and approved scientific and technical methods. Specific treatments are indicated below. Further work details are in the NEDCC files.

Object: ____

Support material: _____ Paper _____ Vellum _____ Other: __________

TREATMENT:

_____ Photographic record made; slides on file at NEDCC.
_____ Fumigated with ______________________________________.
_____ Surface cleaned to remove superficial grime.
_____ Separated from ______________________________ backing.
_____ Flaking paint or other friable media consolidated.
_____ Tapes or old repairs removed.
_____ Inks or colors, being water soluble, fixed to allow washing of object.
_____ Washed in water. _____ Immersed _____ Partially washed.
_____ Alkalized (deacidified) with ____________________________.
    _____ Aqueously _____ By immersion in bath
    _____ Non-aqueously _____ By spraying
_____ Bleached with ______________________________ and thoroughly rinsed
    _____ Locally, only in area of staining
    _____ By immersion in aqueous bath(s).
_____ Other stains removed with organic solvents.
_____ Varnish removed with ______________________________.
_____ Resized with ____________________________________.
_____ Tears or breaks mended.
_____ Retouched (minor abrasions, scratches and other areas of design loss).
_____ Humidified and flattened.
_____ Reinforced or protected further by:
    _____ Backing with Japanese paper
    _____ Backing with ______________________
    _____ Polyester encapsulation
    _____ Matting with acid-free cardboard
    _____ Reframing
_____ Other: ____.

Storage of the material in an acid-free environment at 65 - 70°F and 50% relative humidity and protection from prolonged exposure to the ultra-violet radiation in natural and artificial light is desirable to maintain the integrity and durability of this material.

Date: ____________________ ______________________________

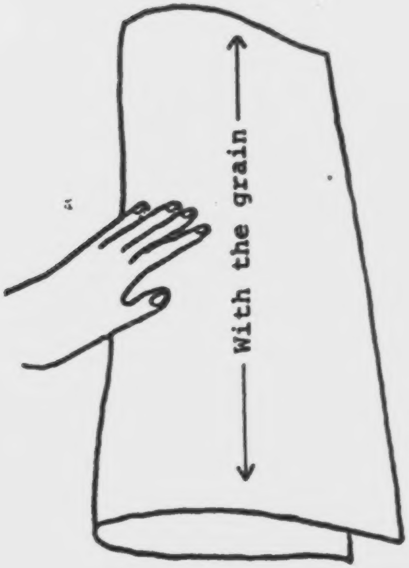
Northeast Document Conservation Center
Abbot Hall - School Street
Andover, MA 01810

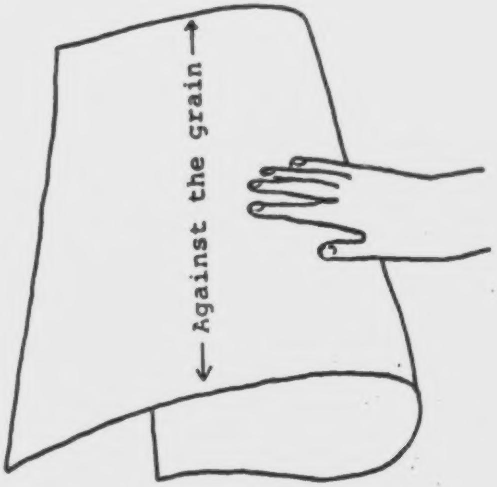
Paper

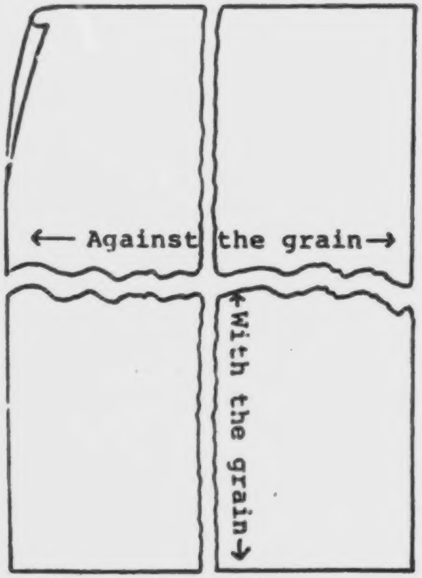
GRAIN OR MACHINE DIRECTION OF PAPER

It is important to know the grain or machine direction of paper before attempting to work with it. When paper is glued or pasted, it swells and expands against the grain. For example, if the paper used for the hollow tube is folded against the grain, the paper will stretch the wrong way and be too large. And when the paper dries, it will be very badly cockled.

1. To determine the direction in which the grain is going, first fold the paper one way (do not crease it) gently pushing it down with your hand, feeling how much resistance is in the fold.
2. Repeat procedure folding the paper the opposite way. You will find that the paper will resist one way more than the other. The way it resists the greatest is against the grain. The easiest way is the direction in which the grain is going, also called machine direction.
3. Another test is to lick one corner. It will curl in the direction the grain is going.
4. Try tearing a piece of paper in each direction. The tear with the grain is much easier and straighter; the tear against the grain is harder and very uneven.







from Gunner, Jean. SIMPLE REPAIR AND PRESERVATION TECHNIQUES FOR COLLECTION CURATORS, LIBRARIANS AND ARCHIVISTS. Pittsburgh, Pennsylvania, Hunt Institute for Botanical Documentation, 1980. (see also 2d ed, 1981)

NEWS from THE LIBRARY OF CONGRESS
INFORMATION OFFICE (202) 287-5108
Washington, D.C. 20540

The Library of Congress continues to move forward in the development of the technology which uses diethyl zinc (DEZ) to deacidify paper in books and other materials, despite two incidents which led to damage and shutdown in February of its book deacidification test facility at NASA.

Although NASA's Accident Investigation Board is expected to complete its investigation in late July, the Library's initial review of the test facility has revealed serious design and procedural deficiencies in the prototype chemical delivery portion of the experimental facility. These deficiencies will be addressed using expertise and experience available in the chemical process industry. It is estimated that it will take 12 to 14 months to redesign, build, and begin operating a new test facility. The start-up date for the main facility has been moved to 1989.

Diethyl Zinc (DEZ) Fact Sheet

Definition: Diethyl zinc (DEZ) is a metal alkyl compound. First described in 1849, it is used as a catalyst for polymerization of many common plastics, e.g. polyethylene, polypropylene, polystyrene, and polyester. It is produced as a liquid and vaporized into a gas for use in deacidification.

Deacidification Process: Books are stacked in special carts and placed in a closed chamber. The air is pumped out to produce a vacuum. The vacuum and a slight heating reduce the amount of water normally present in paper. DEZ gas is introduced into the chamber continuously at low pressure. It both neutralizes the existing acid and forms zinc oxide, which neutralizes future acid. Excess DEZ is pumped out of the chamber and reclaimed. Water vapor and carbon dioxide are pumped in to restore moisture and form the final alkaline reserve.

Treatment Time: It is estimated that it will take 50-55 hours to treat books in batches of 7,500 in each of two chambers.

Advantages of DEZ: DEZ is a very small, highly reactive molecule that diffuses easily between and through the pages of a closed book, allowing mass deacidification. No pre-selection of materials to be treated is needed in terms of inks, binding materials, or size. DEZ reacts with any amount or type of acid in paper and leaves a residue that is non-toxic, slightly alkaline, and inhibits mold growth.

Safety: DEZ burns very quickly in the presence of oxygen in the air and reacts very rapidly with water. Close monitoring and careful handling of the liquid DEZ is necessary, as with similar pyrophoric materials in the chemical process industry.

Chemical and Physical Properties of Liquid Diethyl Zinc

Formula:	$(CH_3CH_2)Zn$
Formula weight:	123.50
Solubility:	Miscible with saturated and unsaturated hydrocarbons. Reacts with alcohols, ketones, esters and carboxylic acids.
Physical State:	Colorless, mobile liquid at room temperature.
Density:	1.205 g/ml at 20°C
Boiling point:	117.6°C
Freezing point:	-35°C
Heat of vaporization:	8.8 kcal/mole
Heat of hydrolysis:	65.6 kcal/mole
Heat of combustion:	847 kcal/mole
Stability to liquid water:	Reacts violently, evolving gaseous hydrocarbons.
Stability to air/oxygen:	Ignites upon exposure (pyrophoric)
Thermal stability:	Kinetically stable at ambient temperatures; decomposition starts at 120°C, becoming strongly, exothermic and self-sustaining above 150°C.

National Preservation Program Office
Library of Congress LM-G07
Washington, D.C. 20540
(202) 287-1840

June 1986

Making
Today's Books
Last

Vapor-phase
Deacidification
at the
Library of Congress

Library of Congress Washington 1985

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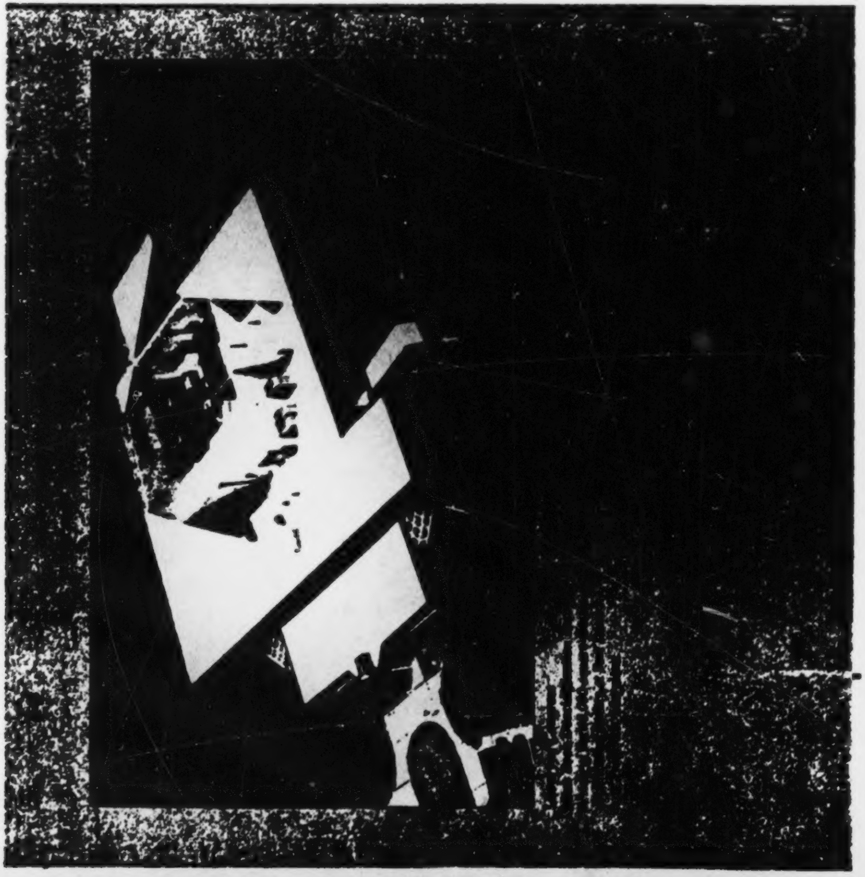


FOR OVER a century librarians and book lovers have watched helplessly as acidic chemical processes have gradually but inevitably destroyed the very paper their collections were printed on. Now, however, a new process developed and patented by the Library of Congress is challenging this threat. Instead of the scant fifty to one hundred years of usable life that twentieth-century volumes have generally enjoyed, books treated with diethyl zinc in the Library's planned deacidification facility will endure, strong and usable, for centuries. The Library, furthermore, will share this vital technology with other institutions so that they, too, can preserve today's books for tomorrow's readers.

The major research and development effort undertaken by the Library in the 1970s matched in scale the threat to its holdings. Twenty-five percent of the Library's books are now too brittle to read without damaging them, and many thousands more become embrittled every year. The cost of traditional preservation techniques—forty dollars to microfilm a single book, for example—seemed to doom all but the most significant items. Now, however, the Library confidently expects to protect its books by deacidifying them at the rate of more than half a million a year, and at a cost of about two dollars per volume.

Control Room
All aspects of the treatment [illegible]
[illegible] and monitored by [illegible]
[illegible] operating the process by [illegible]
control. Process control data for [illegible]
equipment are analyzed in the Control
Room. The location of the Control
Room, although remote, will allow [illegible]
and observation of the [illegible]

A Revolution in Reading

When we entrust ideas to paper, we are actually entrusting them to the physical and chemical properties of cellulose fibers. Paper is a mesh of cellulose fibers. First reduced to a pulp, the fibers are then mixed with water into a thin slurry which is spread n a layer on a large screen. The screen is shaken to remove excess water and intermesh the fibers, thus orming a sheet of paper. The wet sheet is trans-erred to another support, where it is pressed and dried. Substances known as sizes and fillers are ntroduced to render the finished paper smooth and ufficiently water-resistant to accept inks without eathering or smudging. The finished paper's trength and flexibility derive from the nature of he cellulose molecule, which consists of a number f chemical rings connected in a long chain, like widely spaced pearls on a necklace.

Cotton and linen—mainly from old clothing and ags, but also from some natural plant sources—rovided the raw material for the great majority of he paper made in the almost two thousand years etween its invention in China and the Industrial evolution. Papermakers mechanically pulped the ld rags with wooden pestles in large wooden tubs nd made the paper by hand, a sheet at a time. hey added size to the finished sheets by bathing hem individually in solutions made from animal artilage and skins. These methods and materials roduced papers that, though limited in supply, ere strong and long lasting. They kept their rength and flexibility for many centuries because ey were chemically neutral. Books of this hand-ade paper were luxury items for the well-to-do literate class; no large public yet existed for the printed word.

The nineteenth century changed that. Mass literacy and mass production created a mass market for books, magazines, and newspapers. Where eighteenth-century works sold in hundreds, Dickens's, Zola's, or Conan Doyle's stories sold in hundreds of thousands. Although the ragpicker was a common nineteenth-century figure, this new demand drastically outpaced his sources of supply, and papermakers turned to a more plentiful source of cellulose fibers, wood.

Turning wood into pulp in quantities sufficient to satisfy the demand for paper of a newly insatiable public required new methods. Chemical pulping took the place of mechanical pulping. Bleaching the pulpwood to uniform whiteness introduced acids into the paper. Papermakers eliminated the separate step for sizing by adding a size composed of rosin and acid-forming alum to the mixture before forming it into sheets. Where paper had once been an expensive, handmade luxury good that was chemically neutral or alkaline, it was now a relatively inexpensive mass-produced commodity that was acidic and, in the long term, chemically unstable. The paper industry could not have met the popular clamor for reading matter without these new processes, but their use had ramifications that only became apparent decades later.

The Problem: Brittle Paper

A major effect of modern papermaking methods is familiar to anyone who has browsed in a collection of old books. Many volumes, those published more

than 150 or so years ago, remain in excellent, usable condition, their pages white, flexible, and strong. But many more, those published from the mid-nineteenth century onward, have become virtually unusable as ordinary books. The paper has grown inflexible, the leaves brown. When a reader tries to turn them, they break off. Many books are so brittle that normal handling will crumble the paper to fragments. The mere act of opening and reading will damage them, so they have ceased to function as normal books. They cannot be borrowed or used without special preservation procedures, and the information they contain has become drastically less accessible.

Inexpensive machine-made paper has thus proven very costly indeed. The brittle paper problem facing major research institutions is already immense and growing constantly. At the Library of Congress alone, millions of books have already grown brittle. Thousands more become so every year. And with 6,000 new items arriving every day—the great majority printed on vulnerable acid paper that will some day be brittle—the need can only grow in the future.

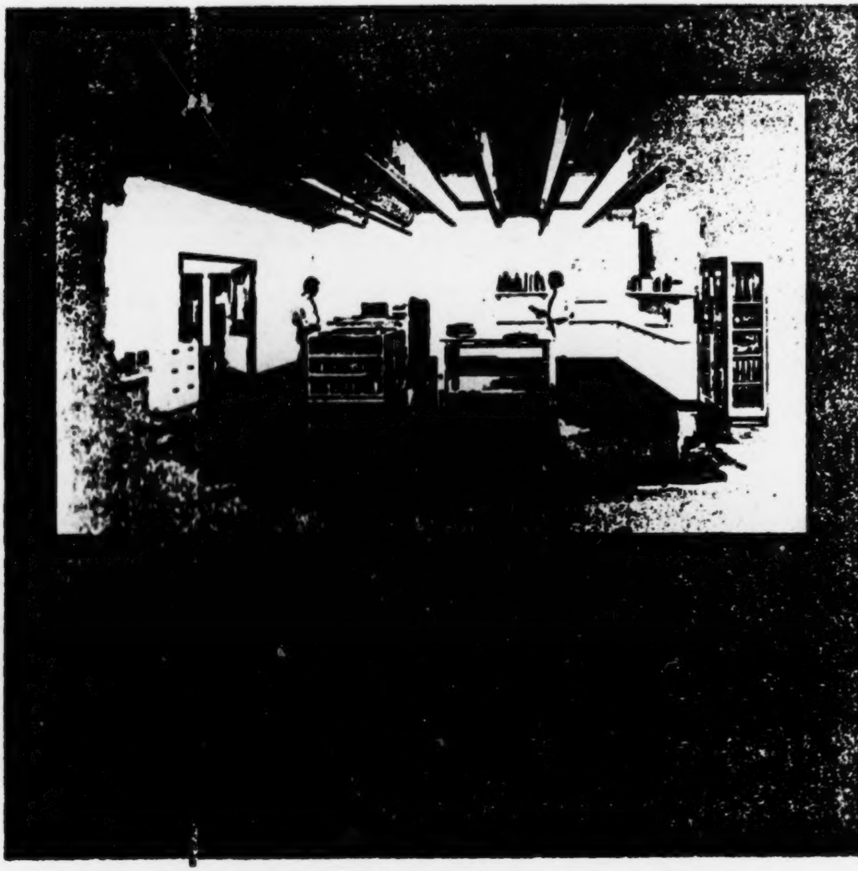
Over the years, the Library has rescued valuable items among its deteriorated holdings through expert conservation treatment using exacting and costly hand methods and has microfilmed many others. But it has still had to leave significant numbers of nineteenth- and twentieth-century books to crumble in a matter of decades.

The Enemy: Acid

The cause of this devastating but inevitable destruction is no mystery. The papers mass-produced from the mid-nineteenth century onward are literally eating themselves from within. Chemical research has conclusively established that the main culprit is the alum added as part of the sizing formula. Chemically, it is aluminum sulfate. Over time, in the presence of moisture, it gradually breaks down to sulfuric acid, which attacks the long chains of the cellulose molecules, breaking them into shorter and shorter pieces. The paper steadily weakens until it finally becomes brittle and unusable.

There are two obvious solutions: to stop printing on acid paper or to neutralize the acid after publication. As a practical matter, the former presents only a partial solution. Increasing numbers of American publishers use alkaline papers. Foreign publishers, however, have made very little progress in switching from acid paper. For the Library of Congress, therefore, with over 50 percent of its holdings published abroad, the best hope of salvaging collections lies with the second proposal, deacidification. Unfortunately, however, this cannot repair the damage to books already embrittled. It will, however, ensure that books still usable will once again last centuries instead of decades.

The deacidification methods traditionally used required slow and expensive hand dipping or spraying of pages with a liquid solution. Clearly, this approach is unsuitable for masses of materials. In the 1970s the Library of Congress determined to find a practical method of deacidifying books inexpensively and in large numbers. This method had to



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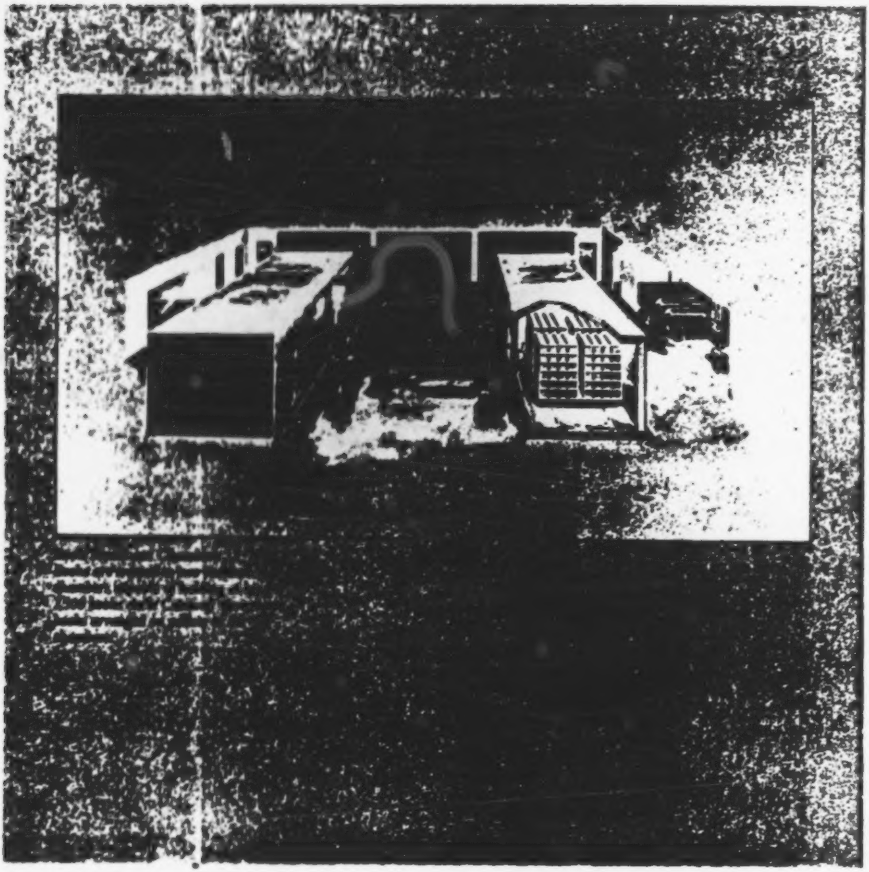

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content and be fully ready to return to the Library.

Although this procedure worked successfully on batches of six or seven books in the lab, it did not yet constitute a process feasible for treating millions. The Library began work to scale the DEZ process up for mass applications, a project that presented many challenging engineering problems that could only be solved by practical trials in a large vacuum chamber.

For access to such a chamber, the Library research team turned to General Electric's facility at Valley Forge, Pennsylvania, where a batch of 400 books underwent DEZ deacidification with some promising results. Nonetheless, this still did not approximate the hoped-for mass scale, and the project demanded a larger vacuum chamber and specialized knowledge in its use. In 1981 the Library enlisted the help of probably the nation's leading experts in the practical uses of vacuum chambers, NASA. Their matchless technical and safety record assured a project that would be completed to the highest professional and scientific standard. In October 1982, at NASA's Goddard Space Flight Center, Northrup Services, Inc., under contract to NASA, carried out the first mass trial of the DEZ process —on 5,000 books at a time—and conclusively demonstrated its feasibility.

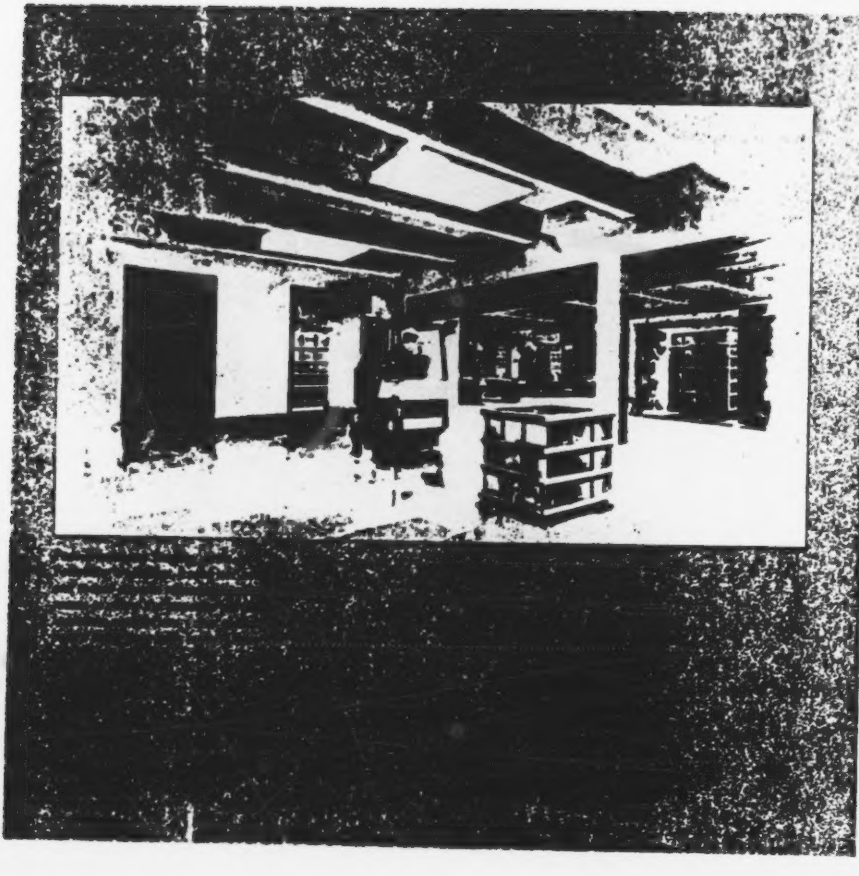
A series of other tests and studies at Goddard and other research facilities now began to look into every conceivable aspect of vapor-phase deacidification: safe methods of handling the materials; exact parameters of effective treatment; potential safety effects on workers; potential effects on readers and personnel in libraries storing large numbers of treated books; and long- and short-term effects on books.

Special attention went into assuring the process's safety for the workers who would apply it, for the books that would undergo it, and for the readers and library staff who would handle the books after the process was completed. The zinc oxide/zinc carbonate buffer system itself—the residue left in the paper—was also studied exhaustively. The familiar tube of zinc oxide ointment has for decades been a staple of the American medicine chest—used on generations of babies for diaper rash and on their elders by the millions for all manner of minor skin irritations. Long accepted as safe and nontoxic for external use, it now underwent additional tests in its new application. The zinc oxide/zinc carbonate buffer system left in books was found to pose no threat whatsoever to the skin or eyes of test animals.

A Permanent Solution

With a practical mass process in hand, the Library in 1983 began planning the special facility to meet its goal of deacidifying large numbers of books quickly and continuously. The plant, located on a 3.5-acre site at Fort Detrick, Maryland, will begin treating books in batches of 15,000 to 16,000 in 1988. Built to stringent environmental and safety standards, it will be staffed around the clock seven days a week to continuously deacidify the Library of Congress's new and existing book collections. It will also serve as both a prototype for similar plants here and abroad and a center for research into the deacidification of other library materials such as prints, maps, and manuscripts.

The heart of the plant is its two identical vacuum



chambers. To insure safety and smooth operation in the unlikely event of equipment failure, the building has what engineers call a highly redundant design; back-up systems exist for all elements of the processing system. A control room in visual and electronic contact with the chambers will monitor and control operations. Behind the vacuum chamber area, and away from the portions of the building most heavily used by personnel, is the room containing equipment for distilling DEZ gas from the liquid form used for transport. Fire walls and fire doors separate the chamber and distillation areas from the rest of the building. Extensive staging areas, used for moving books among the loading dock, storage rooms, and four conditioning rooms, guarantee efficient handling of books and, incidentally, also provide an additional buffer between the chambers and the more heavily occupied areas of the plant.

In addition to the most modern equipment for handling, moving, and treating books, the plant will house two separate, professionally staffed and fully equipped laboratories: a quality control laboratory to assure high treatment standards and a research laboratory to develop methods for treating the sixty million nonbook items that the Library owns. Other features include administrative offices and a conference room, a lunchroom, a first aid station, locker rooms, and a maintenance shop. Safety alarms, and first aid and fire-fighting equipment are located within easy reach throughout the building. Continuous air exchange assures a healthful atmosphere for occupants. An electronic security system assures strict, round-the-clock control of access to the building.

Books will move from Library of Congress shelves to Fort Detrick in containers specially designed to move on dollies, to stack on pallets, and to fit efficiently onto trucks and into the vacuum chambers and holding areas. This "containerized" travel will minimize handling and reduce the chances of damage or loss.

Five days will elapse from the time books arrive at the plant to the time they emerge, deacidified, from the vacuum chamber. They will spend an additional day or two in the conditioning room, where they will regain their normal moisture content before the return trip to the Library. There they will be specially stamped to indicate that they have undergone deacidification—the process being otherwise invisible—before being returned to the shelves.

The Future

For the next twenty years the Fort Detrick plant's capacity will only meet the needs of the Library of Congress and possibly some other federal agencies. The Library's patented DEZ procedure, however, can meet the needs of libraries and readers everywhere. In addition to safeguarding its own collections, therefore, the Library intends to license this technology to other institutions who can build additional plants to deacidify the holdings of the nation's and the world's universities, public libraries, and research centers. According to our best scientific estimates, DEZ-treated books that have strong, high-quality paper to begin with should last for five to six hundred years. Our written record will once again constitute a vital part of mankind's enduring memory.

National Information Standards Organization [Z39]
NISO *Standards for Libraries / Information Sciences / Publishing*

CONTACT:
Patricia Harris
301-921-3241

PRESS RELEASE

FOR IMMEDIATE RELEASE
January 4, 1985

PERMANENT PAPER STANDARD PUBLISHED

The National Information Standards Organization announces the publication of American National Standard Z39.48-1984 Permanence of Paper for Printed Library Materials. The standard is available for sale for $5.00 from the American National Standards Institute, Sales Department, 1430 Broadway, New York, New York 10018.

This standard establishes criteria for permanence of uncoated papers. Paper which conforms to this standard's requirements for pH, alkaline reserve, and freedom from groundwood is anticipated to last several hundred years in contrast to many of the papers now commonly in use.

NISO expects that widespread adoption of this standard for paper will significantly extend the life of the published record and play a major cultural role in preserving and transmitting ideas, images, and information to present and future generations.

The standard recommends that all publications printed on paper that meets the requirements should carry a statement and symbol of compliance. The symbol of compliance is the mathematical symbol denoting infinity set inside a circle: ∞

- OVER -

Z39.48-1984 Press Release January 4, 1985

This standard was developed by a committee of the National Information Standards Organization. Members of the committee included: Gay Walker, chair (Yale University Library, Preservation Department); Lewis Brown (S.D. Warren Paper Company); Howard Goldstein (Simon and Schuster, Inc.); Carolyn Harris (Columbia University Library, Preservation Department); William Lofquist (U.S. Department of Commerce, Printing and Publishing Division); Leonard Schlosser (Lindenmeyr Paper Company); Peter Sparks (Library of Congress, Preservation Department).

The development of this standard was supported in part by a grant from the Council on Library Resources.

The National Information Standards Organization is a national association which promotes uniform and standard practices in information services, libraries, and the publishing industry. For further information on NISO's program of standards development contact: NISO, National Bureau of Standards, Administration 101-Library E106, Gaithersburg, MD 20899.

∞™

The National Information Standards Organization (NISO) designed the symbol on this pin to identify paper which meets American National Standard Z39.48-1984 Permanence of Paper for Printed Library Materials. This standard was developed by the National Information Standards Organization (NISO) which promotes uniform and standard practices in information services, libraries, and the publishing industry.

Paper which conforms to this standard is anticipated to last several hundred years in contrast to many of the papers now commonly in use. NISO expects that widespread adoption of this standard for paper will significantly extend the life of the published record and play a major cultural role in transmitting ideas, images, and information to present and future generations.

For further information on this standard and on NISO's program of standards development, contact: NISO, National Bureau of Standards, Administration 101—Library E106, Gaithersburg, MD 20899 (301-921-3241).

NISO extends its appreciation to all those individuals and organizations whose efforts have made this standard a reality. NISO also acknowledges the contribution of the S.D. Warren Company in providing funds to cover the cost of producing these pins.

REPAIRING PAPER

The generally accepted method of repairing torn paper or reinforcing weak areas in a sheet is a wet method which involves patching with strips of strong, almost transparent acid-free paper. The strips are adhered with a sufficiently strong, colorless adhesive which is both acid-free and easily reversed. The following materials are used and recommended by paper conservators for repair of paper objects. They are used for hinging paper objects as well as mending and reinforcing.

Mulberry Paper:

The preferred acid-free repair paper is handmade in Japan from the inner bark of the paper mulberry tree. Mulberry papers (often erroneously called rice papers) exist in different weights with names such as Sekishu, Tengujo, Kizukishi and Usumino. The lighter weight papers especially Tengujo or Tosa are especially well suited to document repair since they are transparent and unobtrusive and will not obscure the text of the document. These papers are available from conservation suppliers. Some art supply stores also sell Japanese papers, but those tend to be poorer quality machine made types. They resemble the handmade papers but lack permanence and strength. Handmade Japanese papers are ideal for repairs because they are strong, relatively transparent and composed of a high quality alpha cellulose which does not discolor or become brittle with time. Most conservators use torn strips of this paper because a frayed edge makes a less visible repair.

Adhesives:

Use of a proper adhesive is essential. Any adhesive used for mending paper objects must have the following properties:

- Sufficient strength to hold the object for an indefinite length of time -- the adhesive must continue to hold as it ages;
- Permanent colorlessness -- it should not yellow or darken or stain the paper;
- Reversibility -- it must allow the repair paper to be easily removed with a minimal amount of moisture, even after many years.

Few commercially available adhesives meet all these criteria. Rubber cement, animal glues, or gelatin will inevitably darken or stain. Commercial library or wallpaper pastes may lose hold on aging and often contain harmful additives. There are several synthetic adhesives such as white glues which do not stain but which are very difficult if not impossible to remove.

The adhesives found on most "pressure sensitive" (self adhering) tapes will stain almost immediately and should be avoided at all costs. We know of one transparent self-sticking tape which is not supposed to discolor paper, but conservators do not recommend it because it is difficult for anyone other than a conservator to remove. The adhesives on commercial gummed tapes, which require wetting, are less damaging. But most, including the gummed linen tape favored by many framers for hinging may stain in time and should be avoided with objects of value. The glassine stamp hinge paper currently available does not cause staining but is neither strong nor aesthetically pleasing.

Commercial products in general should be avoided even if they appear "safe" because commercial products are subject to alteration by the manufacturer. This year's non-staining tape may have an adhesive with a different formula next year.

Most often recommended: Starch-based paste. For many years conservators have favored homemade starch-based pastes. These are made most often from either rice or wheat starch (not flour but the starch which has been extracted from the flour and which is available from conservation suppliers).

One recipe for wheat starch paste follows:

- Place one cup of wheat starch and five or six cups of water in the top of a very clean double boiler.
- Mix well and let stand at least 20 minutes.
- Fill bottom part of double boiler with a small amount of cold water so that the upper section does not touch the water.
- Place on medium high heat and cook, stirring constantly with a clean wire whisk.
- When the paste begins to thicken (this may happen right away), reduce heat and continue stirring.
- Stir for about half an hour; then remove from stove. The paste should be thick and translucent. As it cooks and thickens, it will become more difficult to stir. To aid in stirring, a wooden spoon may be substituted for the wire whisk, but the spoon should be one which has not been used in the preparation of food.
- When cooked, the paste should be strained through cheesecloth or a Japanese paste strainer (from conservation suppliers) and stored in a clean jar. It should be allowed to cool before use.
- On cooling, the paste may become thick and rubbery. If so, strain again prior to use and slowly mix with water until the paste reaches a workable consistency.

Conservators differ in their preference of how thin paste should be. A consistency similar to heavy cream is adequate for mending.

This wheat starch paste should not be refrigerated. Unless a preservative is added, it will keep for a week or less. Some conservators recommend adding a few drops of eugenol as a preservative; we have found thymol gives longer lasting protection. Thymol, bought in the form of pungent white crystals from chemical suppliers, is not soluble in water so must be dissolved in methyl alcohol (methanol) before being added to the paste. Take 5cc of methyl alcohol (about one teaspoon) and add thymol crystals to it until the solution is saturated; that is until the crystals no longer dissolve. Add the thymol solution to freshly made paste while the latter is still hot and stir for several minutes.

With thymol added, paste will last for several weeks. Do not refrigerate but store covered in a cool, dry place where there is no danger of mold contamination. If paste discolors, grows mold or develops a sour smell, discard immediately. Discard also if dark flecks appear in the paste as these may be the onset of mold or bacterial growth.

A Simpler Paste: Starch pastes do require time to make and thus are not practical if they are to be used only occasionally. A simpler paste can be made by buying methyl cellulose from a conservation supplier. Methyl cellulose comes in powdered form and is mixed with water to the desired consistency. Let stand for several hours before use. It may thicken on standing but can be thinned again with water. Methyl cellulose is not as strong as starch paste but should hold adequately if the document is not to be handled extensively or if it is to be encapsulated in polyester film. Methyl cellulose may be strengthened by addition of a small amount of Jade 403, a white polyvinyl emulsion adhesive available from conservation suppliers. This very strong material should not be used alone because it is extremely difficult to remove after setting. When mixed with methyl cellulose, only a small amount should be used; one part to eight or nine. Methyl cellulose with or without Jade 403 keeps well for several weeks and does not require a preservative.

Applying the Mending Strips:
First apply starch or methyl cellulose paste to the strips of Japanese paper with a flat brush (about ¼ inch wide) before the paper strip is placed on the document. Then lift the strip with tweezers and place over the tear. If the document is one-sided, place it on the reverse. The thinner types of mulberry paper tend to pull apart when wet with paste. It is easiest to use short strips, not more than two inches long. For longer tears, more than one short strip may be used, placed end to end. It will take practice to manipulate the thin, wet mulberry paper repair strips. Once in place, tamp the repair lightly with silicone release paper or polyester web (from conservation suppliers) or with waxed paper from a grocery store. Then blot lightly with a small piece of blotting paper or paper toweling. If possible, weight the repair while it dries. Weighting insures good adhesion and prevents cockling of the paper. Repairs may be weighted as follows: first place small pieces of blotting paper over and under the area to be dried. A piece of glass is laid on top of the blotter and a weight (about one pound) on top of the glass. The weights may be small bags of lead shot or pieces of lead covered with cloth or cloth tape. One pound fishing weights from sporting

goods stores make excellent weights provided they have at least one flat side to prevent rolling. Repairs should be weighted for one hour or longer. Use of a small photographer's tacking iron can speed up the drying process greatly. This instrument should not be applied directly to the document. Place a piece of thin blotter or moderately heavy absorbent paper between the iron and the document. Iron until apparently dry, then weight for a few minutes to encourage flatness.

Repairing with heat set tissue:
In recent years some conservators have repaired tears with thin tissue paper impregnated with synthetic resins. This is applied by pressure and heat from a photographer's tacking iron, preferably on a Teflon coated surface. The tissue to use is the one developed at the Library of Congress which is available from

August Velletri
Bookmakers
2025 Eye Street, N.W.
Room 307
Washington, DC 20006.

The tissue is torn in thin (1/4" x 3/8") strips and laid over the tear shinyside down. Weak areas may be reinforced if necessary with larger patches. A thin piece of Japanese mulberry paper, silicone release paper or white polyester fabric must be placed over the mending strip between it and the iron. The iron should be heated to 190-200°F. Use of a heated platen press set at 180°F gives good results for mending or reinforcing large areas. With a heated press the document should be sandwiched between release paper or polyester and pressed for at least eight seconds.

Ordinarily, heat set tissue is applied to the reverse side of a document. If necessary to support both sides the two tissue patches must be of different sizes, one larger than the other.

The advantage of using heat set tissue is that it is more quickly applied and does not require weighting after application. Heat set tissue is more expensive, however, and is less strong than Japanese paper. Heat set mends may not adhere as well. In general, conservators prefer repairs made of Japanese mulberry paper and a starch based adhesive.

Northeast Document Conservation Center
Abbot Hall, School Street
Andover, MA 01810
617-470-1010

2/81

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Revised April 1, 1982
Revised February 15, 1982
June 1, 1981

WEI T'O® ASSOCIATES, INC.

P. O. Drawer 40, 21750 Main Street Unit 27, Matteson, IL 60443 312-747-6600

WEI T'O NONAQUEOUS DEACIDIFICATION SOLUTIONS AND SPRAYS

Wei T'o nonaqueous deacidification solutions and sprays are widely used, colorless, water-clear, effective deacidifiers valued for their convenience, safety, ease of application, and low unit-treatment-cost. One single treatment last indefinitely, neutralizes existing acidity, deposits a benign alkaline reserve, protects against oxidative attack, sanitizes, and typically increases the life of acidic paper by two to four times.

Wei T'o products are routinely used to preserve books, documents, and works of art, ranging from personal memorabilia to irreplaceable cultural artifacts.

The following technical information is arranged by grouping together the solutions and sprays that contain the same formula. These Wei T'o products have the same deacidifying power, e.g., the capability of introducing a one percent alkaline reserve.

PROPERTIES OF WEI T'O DEACIDIFICATION SOLUTIONS AND SPRAYS

WEI T'O	SOLUTION	# 2	# 3	# 4
	AEROSOL SPRAY	#10	#11	#12
GUIDE FOR SELECTION	Application techniques	# 2: Dipping, brushing spraying, immersion #10: Spraying	# 3: Dipping, brushing, spraying, immersion #11: Spraying	# 4: Dipping, brushing, spraying, immersion #12: Spraying
	Normal application	Thoroughly impregnate, i.e., wet paper	Thoroughly impregnate, i.e., wet paper	Thoroughly impregnate, i.e., wet paper
	Treating papers with soluble inks	Use #2 or #10. Write or telephone Wei T'o for advice		
	Uses	Professional standard Most used solution. Least affect on paper. Most ink mediums are not affected.	Most used aerosol spray. Recommended to less experienced conservators and where solvent vapors cause concern.	Recommended for penetrating thicker papers and boards and maximum sterilization. Greatest ink dissolving power.
	Deacidification power	All three formulations designed to introduce a one percent alkaline reserve		
CHEMICAL PROPERTIES	Deacidification agent	# 2: Methoxy magnesium methyl carbonate #10: Magnesium methyl carbonate	# 3: Ethoxy magnesium ethyl carbonate #11: Magnesium ethyl carbonate	# 4: Ethoxy magnesium ethyl carbonate #12: Magnesium ethyl carbonate
	Primary Solvent	Trichlorotrifluoroethane	Trichlorotrifluoroethane	Ethanol
	Secondary Solvent	Methanol	Ethanol	Trichlorotrifluoroethane
	Propellant	# 2: None #10: Carbon dioxide	# 3: None #11: Carbon dioxide	# 4: None #12: Carbon dioxide
VAPOR PROPERTIES	Flammable	No	No	No. Contact Wei T'o for particulars.
	Maximum allowable concentration	553 ppm of air	936 ppm of air	703 ppm of air
	Maximum quantity of liquid OSHA accepts as vapor in a 10' x 12' x 8' room	1.1 pints	1.9 pints	1.4 pints
		Increase by respective number of pints each time the air in the room is changed. The air in a well ventilated room is changed over 20 times per hour.		
	Vapor hazard	Less than isopropyl alcohol	Similar to ethyl alcohol	Less than isopropyl alcohol

Wei T'o®, an ancient Chinese god, protects books against destruction from fire, worms and insects, and robbers, big or small.

Binding

PRESERVATION FLYER NO. 3: COMMERCIAL BINDING

Commercial binding is a primary preservation activity and as such, is the responsibility of the Bindery Preparations Unit of the Preservation Office. In 1982, the Library's contract for binding services was extensively revised with long-term needs of the collection in mind. The use of acid-free materials was specified for sewing threads, endsheets, spine linings, and case cloth as well as the use of flexible, acid-free adhesives. In every step of the binding process, the least damaging methods and materials were specified. This resulted in major changes in the types of bindings our collections received.

Major types of binding methods now used are:

1. **Recase only**
2. **Through-the-fold sewing**
3. **Double-fan adhesive binding**
4. **Oversewing**

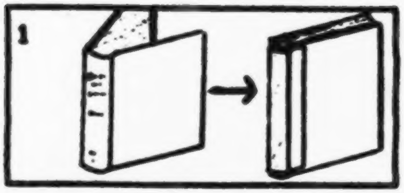
1. **Recase only:** this method is preferred for any previously bound volume with sewing intact, but with a detached or damaged case (cover). The original case is removed and a new one is built and attached, without disturbing the original sewing except to remove old endsheets and attach new ones. All volumes with sewing intact are now being recased rather than rebound.

2. **Through-the-fold sewing:** this method is possible only when the material being bound was originally issued in signatures. Sewing threads are passed through the folds on linen tapes. Openability is the most obvious of the advantages of this method, as it eliminates any strain on the binding when the volume is photocopied, and also makes reading simple and non-destructive. Volumes bound in this manner can be rebound over and over again, without jeopardizing the structure as long as the paper remains strong. All University of Michigan Library volumes in signatures are now being sewn through the fold.

3. **Double-fan adhesive binding:** this method entails the milling off of about 1/8" of the spine(s) and the application of an internally-plasticized copolymer adhesive while the book is fanned first one direction and then the other. There is some loss of margin in the milling and gluing process, but it is minimal and the resulting book opens nearly flat and can therefore be read and photocopied with little damage. Volumes bound in this manner can usually be rebound, provided the margins are adequate. For these reasons, 80% of the Library's volumes are now being adhesive-bound.

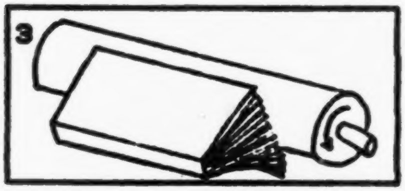
4. **Oversewing:** this method is the strongest but least desirable of all methods described. It demands that the book have at least 5/8" available inner margin, of which up to 1/8" is removed. The book is divided into sections and sewn on a multiple-needle machine. The sewing itself consumes an additional 3/16" margin and the resulting volume demonstrates poor openability, causing extensive damage when photocopied. Further, when the paper becomes brittle, it breaks off at the sewing edge, often causing a loss of text. Since oversewn volumes can only rarely be rebound, this method should be chosen only for volumes with thick coated papers, heavy volumes or high-use items not intended for permanent retention.

METHODS OF AFFIXING LEAVES

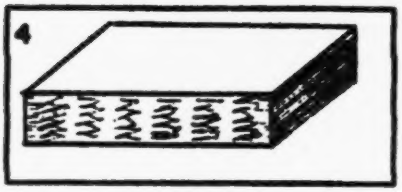


recase only

sewn through-the-fold



double-fan adhesive



oversewn

GUIDELINES FOR YOUR LIBRARY BINDER

Because books differ in value and use, requirements for their rebinding also differ. Usually the most appropriate type of rebinding for books of permanent research value, that is, for books which have more than a limited short-term value but which do not have value as an object, is library binding. The following guidelines are meant to accompany the usual specifications given to the library binder.

These guidelines were drawn up with the needs of the majority of NEDCC clients in mind - New England town record offices, small historical societies, special collections departments and local history rooms in small public libraries. These guidelines are appropriate only when a relatively small amount of binding is being done (about a dozen or so volumes a year). Further, they are only appropriate for volumes which have signatures and are sewn through these signatures (i.e., volumes sewn-through-the-folds). These guidelines are not appropriate where a large volume of library binding is done annually (large research or large public libraries), or where the books needing binding are not limited to books sewn-through-the-folds but include books held together by other means as well.

These guidelines will cause the cost of binding to be higher than usual because of the extra time, handling and special attention necessitated by them. This higher price, however, is not usually prohibitive for institutions doing a small amount of binding.

When questioned informally, several library binders indicated that their firm could take measures such as these if requested to do so. However, some library binders prefer not to take any special measures and/or are unfamiliar with these measures, so you may have to search for a binder who is interested in this type of work. By an attempt to follow the guidelines the books will probably be treated with more care, a few of these measures will be followed, and the work produced will be more permanent as a result.

1.) Do not trim edges of the book.

2.) Do not cut spine of the book.

3.) Retain original sewing of the book if possible. If not possible, resew the book by sewing through the folds.

4.) In mending use paste rather than a white or animal glue. Use non-acid long fibered mending paper (Japanese tissues are preferred). Tear the tissue rather than cut it to avoid sharp edges against which the page could fracture when flexed.

5.) Use materials which are chemically stable and durable throughout the binding process. Of greatest concern are the endpapers which come in direct contact with the first and last pages of the book. Endpapers should be acid-free or, preferably, slightly basic and buffered.

6.) Save original covers, old labels, bookplates or anything else which might be of special interest even if saving this wasn't specified.

7.) Call with questions about materials or procedures.

Northeast Document Conservation Center
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Library Binder-2

GUIDELINES FOR INSPECTING LIBRARY BOUND VOLUMES
UNIVERSITY OF CONNECTICUT LIBRARIES

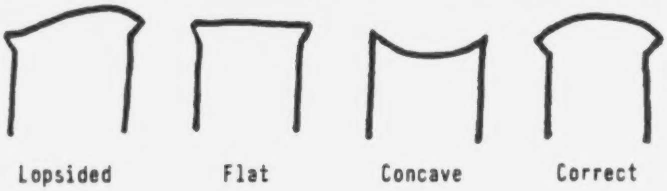
1. INSPECT THE UNOPENED VOLUME

Spine Stamping: Is the spine stamped correctly (i.e., does it match the binding slip and text)? Are lines properly positioned, both vertically and horizontally? Are letters evenly impressed and crisp?

Covering Material: Is the covering material clean (i.e., free from dust and gluey fingerprints)? Is it smoothly and completely adhered to both boards?

Joints: Are the joints (the grooves on either side of the spine) parallel to the spine, and uniformly and adequately deep?

Rounding and Backing: Is the spine of the text block properly shaped at both the head and tail? Do the boards fit correctly below the shoulders of the spine? (If the volume is very thin, or has been recased, the spine may be square or somewhat misshapen. This is acceptable only in these cases.)



Squares: Are the squares (the edges of the boards that extend beyond the text block at the head, foredge, and tail) even, and an appropriate width (1/16" to 3/16", depending on the size of the text block)?

Trimming: Do the edges of the text block appear to have been trimmed? They should not be if the library has a no-trim policy. If trimming is allowed, has text or have parts of illustrations been trimmed away?

2. OPEN THE VOLUME TO ITS APPROXIMATE CENTER; LOOK DOWN THE HOLLOW OF THE SPINE, BETWEEN COVERING MATERIAL AND TEXT BLOCK

Spine Lining: Does the spine lining extend to within 1/2" of the head and tail of the spine? Is it smoothly and completely adhered? If the volume is heavy or thick, has an extra paper lining been adhered over the cloth one? If the volume has been recased, was the spine well cleaned before relining? It should be free from old adhesive and paper.

3. OPEN BOTH BOARDS SO THAT THE INNER SURFACE OF EACH BOARD CAN BE INSPECTED

Endpapers: Are the endpapers smoothly and completely adhered to the boards? Are they properly positioned so that the squares of the boards appear uniformly wide? Are the edges of the endpapers straight-cut and smooth?

Turn-ins: Are the turn-ins (the margins of cloth that wrap from the front of the boards onto the inside) uniform, and approximately 5/8" wide? Are the edges straight-cut and smooth?

Spine Lining: Does the spine lining extend onto each board at least 1"? Is it uniformly wide, head to tail, on each board?

4. EXAMINE THE BINDING SLIP; LEAF THROUGH THE TEXT BLOCK

Specific Instructions: Have all instructions on the binding slip been followed, including choice of method of leaf attachment (if one has been made)?

Endsheets: Is the style of endsheet appropriate for the method of leaf attachment used? Have endsheets for recased volumes been sewn on through the fold?

Interface between endsheets and text block: Open the volume between the endsheets and the first and last pages of the text block. For text blocks that have been double-fan adhesive bound, is the endsheet tipped no more than 1/4" onto the first leaf? (Ideally it should be less.) For text blocks that have been recased, is the gutter between endsheets and first leaf neat and free from the residue of old spine lining?

Text Block: Are all leaves securely attached? Are their edges free from adhesive that inhibits their opening? Are leaves in the correct order? Have all paper repairs been made neatly, and with appropriate materials? (If the library has a policy for making all repairs in-house, have paper tears been noted by the binder?) For volumes that have been oversewn, does sewing run into the print?

5. **A well bound volume should open well and stay open.** For various reasons, this is sometimes not an achievable goal. The paper may be stiff, for example, or its grain may run at right angles to the spine of the volume, rather than parallel to it. A high percentage of all volumes, however, should have good openability. If this is not the case, the library and the binder should reconsider existing guidelines for selecting methods of leaf attachment.

STATE OF CONNECTICUT LIBRARY BINDING CONTRACT
AS APPLIED TO THE UNIVERSITY OF CONNECTICUT LIBRARIES

I. GENERAL INFORMATION

A. SCOPE

1. This bid covers the requirements of all University of Connecticut Libraries at Storrs (herein referred to as the "Library" or "Libraries") using the services listed in the attached proposal schedule, for the period of twenty-four (24) months.

2. The State, with the consent of the contractor(s) (herein referred to as the "Binder"), may extend this contract for an additional twelve (12) month period beyond the indicated expiration date.

B. BID PRICES

1. Prices quoted shall be net, including all pickup, transportation, and delivery charges fully prepaid by the Binder, F.O.B. agency storehouse.

2. **ESCALATION CLAUSE**

   a. All prices shall remain firm from the date of the award through the first twelve (12) months of the contract.

   b. After the initial twelve months of the contract, prices may be subject to adjustment to reflect severe fluctuations in general industry prices or overall cost of living. Adjustments shall be made under the following conditions:

      (1) Price increases shall not become effective until the Bureau of Purchases has received written notice from the Binder. This notice shall indicate an effective date for price increases that allows the Bureau of Purchases at least thirty (30) calendar days to notify the Library. Any volumes shipped by the Library to the Binder prior to the effective date of the price increase shall be bound by the Binder for the price in effect at the time the volumes were received by the Binder.

      (2) Price decreases shall become effective immediately on the date specified in the Binder's written notice of change. This notice shall be sent to the Bureau of Purchases for distribution to the Library no less than thirty (30) days before the reduced prices become effective. The Binder shall bill the Library at the reduced prices on all deliveries made on and after the date of the price reduction.

(3) No more than one price increase shall be allowed during each calendar year of the contract.

(4) The bureau of Purchases reserves the right to reject any proposed increase that it considers unwarranted.

3. **TAXES**

a. Materials and services furnished to the State are not subject to Federal Excise Tax, Federal Transportation Tax, or Connecticut State Sales Tax, and such taxes shall not be included in bid prices.

C. COMPLIANCE WITH SPECIFICATIONS

1. All work is to be done for the Library in accordance with the specifications cited in Sections II, II, and IV of this document. These specifications apply to the binding and protective enclosure of monographs and serials, and are to be adhered to by the Binder unless instructions from the Library direct otherwise.

2. The Library reserves the right to specify methods of treatment for any and all items should this decision-making be deemed necessary for any reason. The method of treatment specified by the Library shall not be changed by the Binder without prior consent of the Library. If an item cannot be treated as specified it shall be returned by the Binder with a written note of explanation.

3. The Binder shall establish the qualifications of the Bindery by submitting the following evidence:

   a. Samples of work for examination by the State, including text blocks that have been double-fan adhesive bound, recased, oversewn, sewn through the fold by machine and by hand, and economy bound; and a selection of boxes and other protective enclosures typical of those made by the Binder.

   b. One sample of each type of endpaper used by the Bindery. These should be marked to indicate the method of leaf attachment with which each is used.

   c. A list of at least three (3) active accounts over $50,000, and persons to contact for performance evaluation.

   d. A statement of the approximate gross sales completed in the last two (2) full years of operation.

   e. Statistics regarding plant resources, including the number of:

      .square feet of plant space
      .full-time regular employees
      .machines for sewing through the fold
      .oversewing machines
      .adhesive binding stations

4. Prior to the contract award and at any time during the contract period the Binder shall permit representatives from the Library or the Bureau of Purchases to inspect the Bindery during its normal working hours.

5. The State only shall have the option to cancel the contract upon thirty (30) days written notice to the Binder for performance that is not in compliance with all instructions and specifications stated herein. Defaulting Binders shall be subject to the provisions of paragraph 39 of Standard Bid and Contract Terms and Conditions, which is a part of this contract.

D. AWARD OF THE CONTRACT

1. It is the intent of the State to make a multiple award to Binders who meet the specifications, terms, and conditions of this proposal. The Libraries shall be allowed to purchase services from one or more of the three successful bidders.

E. SUBCONTRACTING

1. All binding shall be done on the premises of the Binder unless written permission to do otherwise is granted by the State. No subcontracting shall be permitted without the express written approval of the State.

F. INSURANCE AND SECURITY

1. The Binder shall insure, at no extra charge to the Library, all materials against loss or damage from any cause, from the time they leave the Library until they are returned. Each binding shipment is to be insured in the amount specified by the Library, but not for less than $10,000. The limit of liability for an item lost or destroyed shall be a sum that will cover the cost to the Library of reordering, processing, and binding the item. As proof of compliance with this requirement the Binder shall furnish a certificate of insurance to the State.

2. In the event that an irreplaceable item is damaged or destroyed, the Library reserves the right to secure, at the Binder's expense, an independent appraisal of the damage or loss sustained. The Binder shall reimburse the Library in full for repair of damage to, or fair market value of, the item.

G. COMMUNICATION

1. The Binder shall be willing to accept collect telephone calls (or provide a toll-free number) when such calls are warranted because of excessive problems or schedule changes on the part of the Binder.

2. A representative from the Bindery shall visit the Library periodically and be available on request. The representative shall be thoroughly familiar with the terms of this contract, the operations of the Bindery s/he represents, the technical aspects of library binding, and the relationship between library binding and the preservation of library materials.

3. The Binder shall be prepared to provide in-service training for Library staff members involved in bindery preparation activities. Training shall focus on helping the staff to better understand library binding technology and its applications.

H. PACKING, PICKUP, AND DELIVERY

1. The Library shall sort all materials according to instructions from the Binder (e.g., by separating monographs from serials; volumes to be recased from volumes to be sewn through the fold), and shall pack them for shipment to the Bindery. The Binder shall make regularly scheduled pickups and deliveries no less frequently than once every fourteen (14) days unless a different rate of frequency is mutually agreed upon by the Library and the Binder. Materials returned to the Library shall be packed in cartons with lot number, nature of contents, and specific destination legibly marked.

2. All materials shall be bound and returned within thirty (30) calendar days from the date of pickup except when the Library and Binder agree upon a different schedule for return of specific items or shipments. Materials designated "rush" shall be bound and returned within fourteen calendar days from the date of pickup. The binder shall be allowed an upcharge per volume for "rush" work.

3. All pickups and deliveries shall be made indoors at a location specified by the Library, unless the Library agrees to an alternate arrangement. At sites other than those designated in Appendix I of this contract, the Binder shall be allowed an upcharge per volume for those pickups that are smaller than the minimum size specified by the Binder in the attached proposal schedule.

4. All pickups and deliveries shall be made in the Binder's own vehicle.

5. The Bindery must be able to retrieve an individual item from any regular shipment in order to "rush" bind and "rush" return it at the Library's request. The Library shall endeavor to keep such requests for retrieval to a minimum, and shall pay transportation costs for those items that must be returned to the Library by some means more expedient than the Binder's trucking service.

6. Shipping cartons, preprinted address labels, and binding tickets shall be provided by the Binder at no extra charge.

I. ERRORS AND DELAYS

1. Any errors made by the Binder shall be corrected (provided corrections do not damage the text block) without additional charge to the Library, and returned within fourteen (14) days of the Binder's having received them for correction. Any extra transportation costs resulting from such errors shall be paid for by the Binder. Errors that require the skills of a conservator to correct, or that cannot be corrected, shall be subject to Section F.2 (**INSURANCE AND SECURITY**) of this contract.

2. The Binder shall pay a liquidated damages charge of one dollar per calendar week, or any part thereof, for each overdue item. No penalty shall apply in cases where the Library has been notified that the return of an item will be delayed due to the need for special treatment.

J. COMPUTERIZED SERVICES

1. The Binder shall make available, at no extra cost, computer produced services. These shall include, but not be limited to, the following:

   a. A computerized system for producing preprinted tickets for serials binding. The Binder shall be able to provide, within sixty (60) days of receipt of records supplied by the Library, a multiple part binding ticket for each volume of each serial title to be bound during the contract year. Thenceforth, the Binder shall be able to produce a complete file of tickets in advance of each contract year.

      (1) The tickets shall be three-or-more-part, carbon interleaved or pressure-sensitive, and printed with binding patterns for each volume of each serial title bound. A separate file shall be produced for each Library, and each file shall be alphabetized by title. Two of the ticket parts (one of paper, one of light card stock) shall be available for Library use. The copy on card stock shall be suitable for use as a charge card.

      (2) The binding pattern shall consist of: (a) the fixed title and subtitle or other entry, worded precisely as it will be stamped on the spine of the volume; (b) a profile, in correct sequence, of variable information that must be stamped on the spine; and (c) an indication of the correct color of cloth and stamping foil. The Binder shall maintain additions, deletions, and changes to this file (as indicated by the Library) on a current basis. A sample binding slip must be attached to the contract bid.

      (3) The Binder shall provide the Library with blank binding tickets in the same format as described above, on which instructions can be manually produced for materials having no preprinted binding tickets.

b. An alphabetized list of all titles for which binding tickets have been generated, to be printed out on request. A separate alphabetized list shall be furnished for each participating Library. The list shall include the following information: (a) name of Library, (b) title number, (c) binding category, (d) cloth color, (e) title, worded precisely as it will be stamped on the spine of the volume, and (f) variable information profile in correct sequence.

2. The establishment of a computerized interface between the Library and the Bindery is highly desirable.

K. INVOICES

1. The Binder shall provide detailed invoices for each shipment within seven (7) days of delivery of the shipment to the Library. Invoices shall reflect the price structure delineated in the bid proposal, and shall list each category of treatment separately such that the number of items so treated, the charge per item, and the total charge for that treatment, are clearly delineated.

II. TECHNICAL SPECIFICATIONS

All binding shall be done in accordance with the *Library Binding Institute Standard for Library Binding*, eighth edition (Rochester: Library Binding Institute, 1986), herein referred to as the *LBI Standard*. The following specifications are particular to the University of Connecticut Libraries. Paragraphs are numbered to correspond to appropriate sections of the *LBI Standard*.

5.0 EXAMINATION AND COLLATION

In addition to the examination described in Section 5.0 of the *LBI Standard*, all volumes shall be inspected to detect damaged leaves, and characteristics of paper or construction that would make first-time binding or rebinding unadvisable. Items that the Binder regards as poor candidates for library binding shall be returned to the Library with a written note of explanation. Regarding "examination of the head, fore edge, and tail margins...to identify those volumes that cannot be trimmed without cutting into text or illustrations," see Section 7.0 (**TRIMMING THE TEXT BLOCK**) of this contract.

5.2.1 CUSTOM PERIODICAL COLLATION/STANDARD PERIODICAL COLLATION
5.2.2

All periodical collation shall be standard unless instructions from the Library direct otherwise. Incomplete or imperfect volumes shall be returned to the Library unbound unless the Library has instructed the Binder to "bind as is." Where custom periodical collation is requested, an upcharge shall be allowed.

5.3 REPAIR

Regarding paper tears, none shall be mended by the bindery. Whether an item containing a torn page (or pages) is received in damaged condition, or is damaged at the bindery, the item shall be bound if possible (or left unbound if necessary) and returned to the Library with all paper tears flagged.

5.4 MAPS, ILLUSTRATIONS, AND FOLDED SHEETS

Where the Binder determines that stubbing must be added to a text block to compensate for the bulk that would be created by attaching a pocket (with its enclosure) to the inside rear cover of the case, the volume shall be returned to the Library for an alternative treatment decision--for the purpose of avoiding stubbing. The Library may, for example, request that the text block be bound, the enclosure be placed in an alkaline envelope, and the two items be boxed together.

6.0 ATTACHING THE LEAVES

The following guidelines shall apply when selecting the method for attaching the leaves of a volume:

> Where the text block is sewn, and the sewing structure is intact, the volume shall be **RECASED**.
>
> Where the text block is comprised of separate signatures, and the signatures are intact, the volume shall be **SEWN THROUGH THE FOLD**.
>
> Where the text block is not sewn and intact, and is not comprised of separate signatures, the volume shall be **ADHESIVE BOUND** in all cases where the Binder has confidence--based on an assessment of the size, weight, and nature of the text block--in the durability of that method of leaf attachment.
>
> Where the text block is not sewn and intact, is not comprised of separate signatures, is too heavy or thick to be adhesive bound, or has paper that is too thick or glossy to adhesive bind, the volume shall be **OVERSEWN**--provided that the binding margin is wide enough to a accommodate that method.
>
> Where no method of leaf attachment is possible, given the above guidelines, the volume shall be returned to the Library for consideration for boxing.

All staples shall be pulled from side-stapled text blocks to provide a binding margin of maximum width. No side-stapled text blocks shall have staples removed by trimming.

Where the binding margins of adhesive-bound volumes are extremely narrow, the pages shall be pulled away from the original adhesive if this can be done easily, and the binding margin left unmilled.

Regarding serial volumes having (a) single-signature issues with extremely narrow binding margins that must be bound together with (b) an adhesive-bound issue (or issues)--the single signatures shall be sewn through their folds onto sewing tapes and the adhesive-bound issue(s) hand overcast onto the tapes, provided that the binding margins of the adhesive-bound issue(s) are wide enough to accommodate overcasting. When this is not the case, the single signatures shall be prepared for double-fan adhesive binding by slitting through the folds rather than by milling away the folds, to preserve the binding margin.

When serial issues of different heights must be bound together the issues shall be jogged flush at the tail, rather than at the head. In no case shall one or more issues be trimmed for the purpose of making it/them conform to the smaller issue(s) with which it/they must be bound.

6.2.2.1 SEWING THROUGH THE FOLD BY HAND

All volumes that are sewn through the fold by hand shall be sewn onto tapes. Sewing onto sawn-in cords is not acceptable.

6.2.2.2 SEWING THROUGH THE FOLD BY MACHINE

When a volume consists of a single signature only, it shall be sewn through the fold by hand. Sewing such volumes through the fold by machine is not acceptable.

6.3.1 ADHESIVE BINDING--PREPARATION

When a text block is thick, heavy, or has stiff or glossy paper, the spine shall be notched in preparation for double-fan adhesive binding.

6.5 SIDE SEWING

Side sewing is generally regarded by the Libraries as an unacceptable method of leaf attachment. In cases where the Binder ascertains that side sewing is the only appropriate method of leaf attachment the volume shall be returned to the Library with a note requesting permission to side sew.

7.0 TRIMMING THE TEXT BLOCK

Text blocks shall not be trimmed by the Binder unless the Library has provided specific instructions to do so (e.g., because the pages of a text block are uncut, or because their edges are badly damaged).

9.2 EXCEPTIONS TO ROUNDING AND BACKING

In addition to the exceptions listed in the LBI Standard, text blocks less than 1/2 inch thick shall not be rounded and backed.

The Libraries reserve the right to add to the list of exceptions to rounding and backing, or to increase the guidelines regarding thickness of text blocks that should not be rounded and backed, should research suggest strongly that this is advisable.

11.2 STAMPING THE COVERING MATERIAL

The size of type for all spine stamping shall be as large as possible up to 18-point for letters, and 18- or 24-point for numbers (depending on the Binder's stamping equipment), given the width and height of the spine. The order of priority for stamping call numbers on the covers of classified volumes is: (1) in horizontal lines running across the spine, (2) in vertical lines running down the spine, and (3) in horizontal lines in the upper or lower left-hand corner of the front cover (as specified by the Library) as close to the joint as possible. Option three (3) shall be exercised only if the volume is so thin and short that the call number will fit neither horizontally nor vertically on the spine. In no case shall the call number be stamped on the front cover to make room for author or title information on the spine. The call number always takes precedence on the spine.

20.0 STAMPING FOIL

The Binder shall use white stamping foil unless an alternative has been requested by the Library.

The following specifications are intended to supplement the Technical Specifications of the LBI Standard. Paragraph numbers do not refer to any section of that standard.

X.1 ATTACHMENT OF BINDING SLIPS

Binding slips shall be left unattached, if possible. Otherwise, they shall be attached to the page following the verso of the title page whenever possible, in such a way that the page is not damaged or marred when the slip and the tape or sticker used to attach it are removed.

X.2 CONSTRUCTION OF POCKETS

Pockets shall be constructed so that the materials they contain are firmly supported, and are not easily damaged when they are inserted or removed from the pocket.

III. MATERIALS SPECIFICATIONS

All materials used for binding and for making protective enclosures shall conform to the Materials Specifications of the LBI Standard. The following specifications are particular to the Libraries using the services listed in the attached proposal schedule. Paragraphs are numbered to correspond to appropriate sections of the LBI Standard.

16.4.2 EXCEPTIONS TO GROUP F BUCKRAM

The Library shall request that Group C-1 book cloth be used on selected light-weight volumes, the binding of which will otherwise conform in all respects to the above specifications.

18.0 THREAD

The Library reserves the right to alter specifications for thread as cited in Sections 18.1, 18.2, and 18.3 (**Thread**) of the LBI Standard, should research suggest strongly that alteration is advisable.

IV. SUPPLEMENTARY SPECIFICATIONS

L. ECONOMY BINDING

Binding procedures for economy paperback binding are the same as those for standard double-fan adhesive binding except as follows:

1. Text blocks shall be no taller than 12 inches and no thicker than 1-1/2". Collating is not required.
2. The spine shall be lined with a stretchable spine lining in accordance with Section 6.3.2 (**Double-Fan Adhesive Binding--Process**) of the LBI Standard, but no second lining as required in Section 10.0 (**Lining Up the Spine**) of the LBI Standard) shall be applied.
3. Text blocks shall not be rounded and backed.
4. Two types of covering material may be specified by the Library:
   a. Grade C-1 book cloth, the color to be selected by the Binder.
   b. A laminate made by removing the complete original cover from the paperback and laminating it between paper and clear polyester film.
5. No cord shall be added at the head or tail of the inlay.

6. Brief author, title, and call number information shall be stamped on the spines of volumes bound in Grade C-1 book cloth. In no case shall the call number be stamped on the front cover to make room for author or title information on the spine. The call number always takes precedence on the spine. No title, author, or call number information shall be stamped on the spines of polyester-laminated covers.

M. PORTFOLIOS

1. Portfolios shall conform to the design that is described and illustrated in Boxes for the Protection of Rare Books: Their Design & Construction (Washington, D.C.: Library of Congress, 1982), pp. 37-55.

2. The Library may request Group F buckram, C-1 book cloth, or an alternative cloth for use as a covering material. An upcharge shall be allowed when deluxe cloths are specified. Ties shall be made from a high-quality dye-fast cotton twill or nylon tape, or unbleached linen tape. The cut ends of the tape shall not ravel.

N. DOUBLE-TRAY BOXES

1. Double-tray boxes shall conform to the design that is described and illustrated in Boxes for the Protection of Rare Books: Their Design & Construction (Washington, D.C.: Library of Congress, 1982), pp. 247-89.

2. The Library may request Group F buckram, C-1 book cloth, or an alternative cloth for use as a covering material. An upcharge shall be allowed when deluxe cloths are specified.

3. The spines of double-tray boxes shall be stamped using the color of stamping foil specified by the Library. Where deluxe cloths are requested, the Library may specify inlaid labels--in which case an upcharge shall be allowed.

O. PHASE BOXES

1. Phase boxes shall be configured such that two custom-cut strips of board are crossed and adhered (the vertical strip inside the horizontal one) to form a rear board and four flaps. These flaps shall wrap around the enclosed item(s) to provide firm support. The flap that is folded over the contents first shall cover the entire contents, and shall be stamped "Fold This Flap First." The flap that comprises the outer front board of the phase box shall be creased at the fore edge and bent at a right angle to form a flap that covers the fore edge of the box.

2. Phase boxes shall be held closed by plastic disks riveted into place, and very strong cord ties that will not ravel. Disks and rivets shall be attached to the fore edge flap of the box (not to the front or back surface of the box) so that the box does not damage materials that will be shelved beside it.

3 Phase boxes shall be constructed of strong, flexible, alkaline/ buffered board that will crease without delaminating. The Library may select gray/white barrier board (approximately 55 point) or lignin-free board of approximately the same thickness.

4. Brief author and title information and complete call numbers shall be stamped on the spines of phase boxes using black stamping foil.

5. Cased-in phase boxes shall consist of a phase box constructed as specified above, and attached to the inside rear board of a case made as specified in Sections 11.0 - 11.5 (**Making the Case**) of the LBI Standard. Where the boxed material is very heavy or thick, the phase box shall be attached flush with the bottom of the case.

P. IMPROVEMENTS AND INNOVATIONS IN METHODS AND MATERIALS

Any improvements in traditional methods and/or materials used by the Binder shall be acceptable to the Library within the terms of this contract under the following conditions: the methods and/or materials must undergo extensive, documented testing that measures their strength, durability, and functional qualities (e.g., the openability of the bound volume); and tests must clearly indicate that the innovation(s) will lead to equal or better protection and equal or greater longevity of the volume. Adoption of any technical innovation, or use of any new material, must be approved in writing by the Library.

PROPOSAL SCHEDULE

1. Monographs up to and including 12" in height (2-1/2" thick or less) $__________

2. Serials up to and including 12" in height (2-1/2" thick or less) __________

3. Upcharge per inch over 12" in height for monographs and serials __________

4. Upcharge per inch over 2-1/2" in thickness for monographs and serials __________

5. Upcharge per volume for "no trim" policy for monographs and serials __________

6. Upcharge per volume for recasing __________

7. Upcharge per volume for sewing through the fold __________

8. Upcharge per volume for binding flush with the bottom of the case __________

9. Upcharge per cover (i.e., front or back cover) for mounting paperback covers on buckram or C-1 case __________

10. Upcharge per volume for custom collation __________

11. Upcharge per volume for "reference books," per Section 4.2 (Reference Books) of LBI Standard (i.e., color of covering material specified for non-journal) __________

12. Paper pocket for map or other enclosure __________

13. Fabric pocket for map or other enclosure __________

14. Stubbing, per 1/2" thickness __________

15. Charge per volume for stamping first four lines of call number __________

16. Charge per line in excess of four for stamping call number __________

17. Economy binding (not to exceed 12" in height or 1-1/2" in thickness) __________

18. Theses (stamped on spine only) __________

19. Portfolios up to and including 12" in height $________

20. Upcharge per inch over 12" in height for portfolios ________

21. Double-tray boxes up to and including 12" in height ________

22. Upcharge per inch over 12" in height for double-tray boxes ________

23. Phase boxes constructed of gray/white barrier board, up to and including 12" in height ________

24. Upcharge per inch over 12" in height for phase boxes constructed of gray/white barrier board ________

25. Phase boxes constructed of tan lignin-free board, up to and including 12" in height ________

26. Upcharge per inch over 12" for phase boxes constructed of tan lignin-free board ________

27. Upcharge for cased-in phase boxes ________

28. Charge per volume for inserting theft detection devices (devices to be furnished by Library) ________

29. Charge per hour for extra work or special treatments not listed above (hours and type of work to be stated on invoice ________

30. Upcharge per volume for rush service ________

31. Minimum number of volumes per pickup per designated site other than those listed in Appendix II of this contract ________

32. Upcharge per volume if pickup from site other than those listed in Appendix II of this contract is less than minimum quantity stated above ________

Commercial Library Binding: An Annotated Bibliography

SERIALS

Abbey Newsletter. v. 1--, August 1975--

The Abbey Newsletter (ANL) is written primarily for bookbinders and conservators, but anyone involved in preservation administration will also benefit from reading it. It publishes factual articles on all aspects of conservation, news items, announcements, literature reviews, and evaluations of equipment and supplies. A new feature, "Forum", gives the concerned individual opportunity for public analysis and discussion of issues related to the preservation field. ANL serves an important function by providing a common forum in which both the professional and knowledgeable layman can exchange ideas and experience.

Conservation Administration News. No. 1--, June 1979--

This quarterly publication is invaluable to anyone involved in the administration of library or archives preservation. It contains profiles of preservation facilities and programs, reviews of publications, notices of upcoming events, workshops, and conferences, as well as articles about the event. It also publishes articles on areas of general interest. CAN is aimed at the librarian in charge of a preservation unit; this specific focus makes it especially useful.

New Library Scene. v. 1--, September/October 1982--
Supersedes **Library Scene.**

The New Library Scene (NLS) is published by the Library Binding Institute (LBI), a trade organization comprised primarily of library binders. NLS carries articles on binding style, technique, history, and technical innovation. It should be read by anyone overseeing a library preservation program.

Publishers' Weekly. v. 1--, January 18, 1872--

Publishers' Weekly (PW) is a trade journal of the book publishing industry. While not as directly relevant to the preservation officer as Abbey Newsletter, CAN, or The New Library Scene, PW often contains material of interest. The first issue of the month contains a column on new developments in book design and manufacturing; an annual technology review appears in a December issue. The preservation librarian would do well to keep abreast of new materials and methods used in book production as this is the material (s)he will be called upon to maintain in usable condition.

BIBLIOGRAPHY

"Appendix B -- Commercial Library Binding," **RLG Preservation Manual.** Stanford, CA: Research Libraries Group, Inc., 1983. p. 101-106.

The RLG Preservation Manual describes various aspects of the RLG Preservation Program, and is intended to provide information to aid local efforts. Appendix B to that manual is entitled "A Preservation Workbook." This workbook contains guidelines for the care of library materials, and includes a number of short bibliographies on many areas of preservation. The section on commercial library binding is broken down into two sets of guidelines and readings, for first-time binding and for rebinding. The cited publications provide a brief view of the history and development of library binding, review the current technology, and suggest ways to use knowledge of these two fields to increase the useful life of library materials. The portion on library binding can be read and used independently of the other sections, but to place binding in its proper perspective as one component of a well-rounded preservation program, one should carefully study the entire manual.

CONTRACTS, HANDBOOKS, MANUALS, STANDARDS

Columbia University Libraries. Preservation Department. **The Preservation of Library Materials: A CUL Handbook.** New York: Columbia University Library, 1980.

The CUL handbook is intended to help the staff make informed decisions about binding. Although the guidelines were written for CUL libraries, they could be adapted to suit the needs of other libraries and used to establish a binding program or evaluate an existing one. The handbook provides information on a wide range of treatments available through library binders. The detailed descriptions of treatment alternatives matched to the characteristics of the individual item make this document a valuable resource.

State of Connecticut Library Binding Contract.1984. Available from the Preservation Department, Homer Babbidge Library, University of Conneticut, Storrs, CT 06268.

This excellent document could serve as a model contract between library and library binder. It is divided into five major sections: general information; specifications for materials; specifications for standard binding of monographs and serials; economy paperback binding; miscellaneous treatments. The detailed expansions of each area establish clear guidelines for library/binder relations, for service to the library by the binder, and for materials and methods to be used by the binder in fulfilling the terms of the contract. It would be instructive to read this contract in conjunction with both Columbia University Library's Handbook and with the Library Binding Institute's Standard for Library Binding.

Library Binding Institute. **Standard for Library Binding.** Rochester, N.Y.: Library Binding Institute, revised edition expected Fall 1985.

LBI is a 50 year old association of the library binders, providing training services and certification for members and publishing The New Library Scene. LBI's Standard specifies methods and materials for library binding. The emphasis is on describing durable bindings; the Standard does not prescribe a particular type of binding for a particular material. The committee working on the revision included a preservation librarian, Jan Merrill-Oldham and the latest edition, when published, will be far more complete than the 1981 edition.

Tauber, Maurice. **Library Binding Manual.** Boston: Library Binding Institute, 1972.

This manual provides basic information about library binding. It is intended as a reference tool in preparing materials for binding. The information is dated in some cases, but the basic concerns with maintaining all materials in usable condition and with extending the life of selected materials in their original format are still of primary interest to librarians in charge of collection maintenance.

ARTICLES

McCrady, Ellen. "Preserving Inner Margins in the Library Bindery," **Abbey Newsletter**, 3(3):29-34, September 1979.

The author describes the steps a library binder can take in handling material with narrow binding margins. The routines discussed are all designed to preserve as much of the inner margin as possible. Some of the methods proposed are not routinely practiced by library binders. Instructing the binder to use methods outside normal routine can result in higher costs, but McCrady stresses the importance of determining the best method for solving each particular binding problem.

Merrill-Oldham, Jan. "Getting Educated: A Librarian's View." **The New Library Scene**, 3(3):1,6,13, June 1984.

This article clearly delineates the steps librarians must take to become informed about library binding. To do less is to ignore the physical well being of their collections. The author suggests that knowing how to set up binding patterns and schedule shipments is not enough; librarians responsible for binding must also learn about the technical aspects of binding.

Merrill-Oldham, Jan. "Binding for Research Libraries." **The New Library Scene**, 3(4):1,4-6, August 1984.

The author is the Head of the Preservation Department at the University of Connecticut Libraries and a well-known expert on library binding. This article outlines the major preservation issues of library binding and in particular discusses the options for leaf attachment (sewing through-the-fold, adhesive binding, etc.) with an eye towards their application in research libraries.

Parisi, Paul A. "Methods of Affixing Leaves: Options and Implications," **New Library Scene** 2(5):9-12, November/December 1982.

This article provides an outline of the advantages and disadvantages of eight methods of leaf attachment. The author, a library binder, emphasizes the importance of the customer knowing the range of factors that must be considered when determining the appropriate binding method. This is a balanced treatment of not only binding technique and technology, but also of the difficulty of achieving acceptable results under budget constraints.

Rebsamen, Werner. "Endpaper Construction for Recasing." **The New Library Scene**, 4(3):15-18, June 1985.

The author describes and illustrates six alternatives for endpapers to be used when the original sewing is being retained, and a book is receiving only a new cover. The method of attaching endpapers to an existing textblock is very important to the viability of the resulting binding. Other aspects of successful recasing are also noted.

Roberts, Matt. "The Library Binder," **Library Trends**, 24(4):746-62. April 1976.

This is a clear, informative discussion of library binders, intended for the librarian in charge of a binding unit. The author explains the various services and binding styles offered by a library binder. Most important, Roberts gives detailed information on selecting the binder(s) whose skills and services meet a client's particular needs. He also gives instructions on evaluating a binder's work. Despite its age, this is a useful article for the librarian in charge of a preservation binding operation.

Roberts, Matt. "The Role of the Librarian in the Binding Process," **Special Libraries** 62:413-420, October 1971.

This article, written from the librarian's viewpoint, is aimed at the librarian in charge of the libary's binding unit. Its purpose is to instruct the reader in the fundamentals of book structure, bookbinding processes, binding technology, and the basic tenets of library preservation. That understanding enables the librarian to make informed decisions. The author discusses writing binding specifications and a contract tailored to the needs of the individual library.

Roberts, Stephen. "What the Library Binder Expects from the Librarian," **Library Scene** 7(3):2-4, September/December 1973.

The author, a library binder, emphasizes the need for increased communication between librarians and binders as the two groups resonsible for the preservation of library materials. He discusses what the binder expects from the librarian, makes a straightforward presentation of the binder's concerns, and suggests ways in which the librarian can help the binder provide better service.

Walker, Gay. "Library Binding as a Conservation Method," **Collection Management** 4(1/2):55-71, Spring/Summer 1982.

This article introduces commercial library binding technology and methods as "conservation" measures in research libraries. The author considers library binding a conservation measure if it extends the life of the book while leaving the option to rebind the item at a future date.In this article, Walker reviews the many factors that must be considered when choosing the best method for binding a particular item. Because it covers many important aspects of both library binding and library preservation in detail and at an advanced level, this article should be read after the more basic literature.

Carla J. Montori
Revised August 1985

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LBI
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Binding for Research Libraries

By Jan Merrill-Oldham

There are several methods that can be used by the library binder to attach the leaves of a book together to form a text block. The importance of choosing the binding method most appropriate for any given volume has been discussed frequently in recent years, not only in the literature, but at conferences and at the business meetings of librarians and binders. Two very good articles on the subject have appeared recently in **The Library Scene:** "Methods of Affixing Leaves: Options and Implications" by Paul Parisi (Vol. 2, no. 5, October 1983), and "Library Binding as a Conservation Measure" by Gay Walker (Vol. 3, no. 2, April 1984). This paper does not attempt to reiterate the points made by Parisi and Walker, and readers not already familiar with library binding technology will find it useful to refer back to those earlier articles for detailed descriptions of the several methods of leaf attachment cited there.

The full value of learning about binding methodology is gained when that knowledge is put to practical use in the library. One way to do so is to develop a flow chart for making binding decisions. The first order of business in drawing up such a chart is to define the collection being bound — that is, to describe its nature and intended use. Based on that definition, and careful consideration of the strengths and weaknesses of the methods of leaf attachment now in use in library binderies, a set of guidelines can be constructed. The flow chart on page 22 suggests an approach to the binding of research library collections (i.e., collections of materials that are purchased for long-term retention). Binding techniques have been put in priority order based on their ability to yield the following desirable characteristics:

- The binding method should be as conservative as possible (i.e., it should alter the text block only minimally).
- The binding method should be as non-damaging to the text block as possible, and should not shorten its useful shelf life.
- The bound volume should open easily to a 180-degree position to facilitate non-damaging photocopying.
- The bound volume should stay open when resting face-up on a flat surface, so that the reader has both hands free and can take notes easily.

Why these criteria should be different from those established by other types of libraries might not be immediately obvious. In theory, they are highly desirable under any circumstances. In practice, however, whether a library can justify the extra cost of binding a twentieth century novel in the optimal way will depend on whether that novel will be retained indefinitely, or withdrawn when its popularity wanes. The cost factor is not taken into consideration in the decision-making model outlined here; rather, it is assumed that the added costs of employing optimal methods are reasonable given the overall goals and objectives of the institution. Upcharges for the "new case only" and "sew through the fold" methods generally result in only a modest increase in per-unit costs over the base cost of double-fan adhesive binding or oversewing. Upcharges do add up, however, and can be impossible for the non-research library to justify.

Preliminary Caveat

It is essential that libraries identify those materials that should not be library-bound, and earmark them for alternate treatment. Brittle monographs and journals are inappropriate candidates for commercial binding. A crude but useful test for embrittlement is to fold the corner of a page forward, dog-ear fashion (the "ear" should be small). Fold it backwards on the same

(continued on page 4)

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Continued from page 1

crease, then repeat the process a second time (folding four times in all). If the paper breaks at the fourth fold or before, it is too degraded to bind. Although brittle books can often be successfully adhesive bound, such treatment actually does more harm than good. It implies that the item has been restored to usable condition, when in fact the text is vulnerable to breakage and consequent loss. Assuming that the option of withdrawing a brittle book from the collection has already been considered and rejected, alternatives for preserving it include replacement with a reprint, reproduction on microfilm or acid-free paper, and boxing it to await future treatment.

Items that have artifactual value are also unsuitable candidates for library binding. Whether a book will be deemed an artifact depends on a variety of criteria too complex to discuss here, but guidelines should be clearly spelled out in a library's binding policy statement. At the University of Connecticut Libraries at Storrs, for example, materials from Special Collections, pre-1850 imprints from the general collections, and notable machine-stamped bindings published between 1830 and 1920 are among those categories of materials that are rarely *library*-bound. Rather, they are treated in-house; or boxed to await treatment either in-house, or by professional conservators in the region.

New Case Only (called "retained binding" by Parisi)

The first thing to ascertain when deciding how to bind a volume is whether the text block consists of signatures that have been sewn through the fold; and if so, whether both the sewing structure and thread are sturdy and all the leaves of the text block attached. If these conditions are met, the binder can clean residual glue from the spine, reglue and reline it, and make and attach a new case (as described by Parisi and Walker). The end product has all four of the desired characteristics listed above. Issues of serials that will be bound separately and that consist of multiple signatures that are sewn through the fold can also be treated this way. It must be remembered that two issues, both of which are made up of several signatures, cannot be joined together in one case using the "new case only" method. New case only means just that; no sewing or other method of adhering leaves is involved. Text blocks that have been adhesive bound by the publisher should not be newly cased only. They are usually executed using inferior glue, and are not to be trusted. Rather, the original glue should be milled away and the text block double- fan adhesive bound by the binder.

Sewing Through the Fold (called "center fold sewing" by Parisi)

This method is most often used on serials that are issued in single-signature format, such as **Newsweek.** Through-fold sewing is done by machine or by hand, depending on the thickness of the individual issues. The end result, like the newly cased volume, meets all four criteria on the "desirable characteristics" list. Monographs can also be sewn through the fold, but they rarely are because of the extensive preparation required to do so. The

Continued on page 5

GUIDELINES FOR AUTHORS

Please follow these procedures for submitting manuscripts to THE NEW LIBRARY SCENE:

1. Submit original, unpublished articles only. Do not submit manuscripts being considered for publication elsewhere.
2. Articles should be 1500 to 3000 words in length on subjects of interest to librarians.
3. Write in simple, readable style that is grammatically correct. Please remember the author is responsible for the accuracy of all statements in the article.
4. Manuscripts should be typed, double spaced on 8½ x 11 inch non-eraseable, bond paper.
5. Consult Webster's Ninth New Collegiate Dictionary for spelling and usage. We prefer first spelling. Verify the spelling and accuracy of all names included in the article.
6. Be prepared to supply photographs or other camera-ready illustrations if applicable.
7. Be sure to keep a copy of your article for your files. Only manuscripts accompanied with return postage will be returned to the author.

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Continued from page 4

original adhesive must be removed from the spine, the original sewing threads cut in many places and removed, the signatures gently separated, and all damaged folds skillfully repaired. (In contract, issues of serials need only have the staples removed from the center fold; and it is usually only the covers that need repair.) The cost of this preparation is high, unless (or even **if**) it can be done in-house, before the volume is sent out for binding. Consequently, monographs are usually sewn through the fold only when the original sewing structure is damaged; and critical illustrations or text that bleed to the center fold, making it impossible to mill the spines for adhesive binding or oversewing.

Double-Fan Adhesive Bind

Unlike volumes that are newly cased only, or sewn through the fold, the spine of a text block must be milled (i.e., shaved away using a rotary blade) before it can be double-fan adhesive bound. For this reason the first two options on the flow chart are to be preferred. If, however, the volume to be bound is not sturdily sewn in signatures, or published in single-signatures format, adhesive binding is the next most desirable option. This method works equally well for monographs and serials **if** the text block is not too heavy or the paper too glossy. Like the two techniques discussed above, it results in a volume that opens well for photocopying and reading. If the adhesive method is used judiciously the end product will be a durable binding. (An experienced binder will be able to assist library staff in determining what types of materials can be successfully adhesive bound.) In fact, the technology is becoming ever more reliable as the quality of adhesives improves and binders seek better ways of applying them, and as new machinery is developed. The Mekanotch, a recent import to the United States, is one such machine (q.v. Parisi, p. 12). It has been said by some optimists that eventually the notched, double-fan adhesive bound volume will nearly replace the oversewn one — that even very thick, heavy text blocks will respond well to this method; other observers are more cautious. Test results are not yet in, but it is possible that notching will greatly expand the range of materials that can be double-fan adhesive bound with excellent results.

Oversew

In cases where none of the first three binding methods can be used, oversewing is a suitable option **if** the inner margin of the text block is at least ½" wide. As Parisi and Walker have pointed out, the spine edge of a text block must be milled before it is oversewn, which removes up to ⅛" of margin; and the oversewing itself often uses as much as an additional ¼". Clearly, the volume that has only a ½" margin to begin with will have an inadequate one, if any at all, after it is oversewn. On the other hand, since in the model described here, oversewing is the last available method, it would probably be chosen even under these borderline circumstances. In addition to the two disadvantages of oversewing that Parisi lists, a text block so treated often has poor openability. A simple way to observe this is to open an oversewn volume, lay it on a flat surface, and let go of it. It may snap shut — particularly if it is small-to-medium-sized. This response can be observed in both monographs and serials. Oversewing is very useful, however, for attaching the leaves of text blocks that are too heavy or glossy to adhesive bind.

Box

When materials meet none of the criteria that appear in the left-hand column of the flow chart, boxing is a better alternative than putting an item back into the stacks as is, or withdrawing it simply because it cannot be rebound. A heavy volume printed on glossy paper, with inner margins only ⅜" wide, and the original sewing structure not intact, might be boxed. (The only other alternative would be to try an adhesive binding.) Binders usually offer several varieties of protective enclosure, including portfolios and double-tray boxes, and some have begun manufacturing inexpensive acid-free board wrappers, (called phase boxes) that serve as useful a function as a fancier box.

Other Options

Two methods of leaf attachment that are used by binders, but which do not appear in the accompanying flow chart, are side stitching and

Continued on page 6

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Continued from page 5

cleat lacing. It seems that since most volumes that can be side stitched can **also** be double-fan adhesive bound, and since the latter results in a text block that has good openability, adhesive binding would be the preferred option. Since cleat lacing is noted neither for its durability nor its openability, and since any volume that can be cleat laced can also be adhesive bound or oversewn (depending on the nature of the paper and the weight of the text block), those latter options appear to be the better choices.

Decision Making

Once a suitable flow chart is devised, whether it resembles the one shown here or is an entirely different model, who should decide how each worn and damaged volume will be bound? In some libraries every volume is inspected in the bindery preparation unit, a decision is made by the staff, and instructions typed on a binding slip. If the bindery cannot follow instructions for any reason, the volume may be returned to the library and the decision reconsidered, or the bindery may have blanket permission to change a decision when necessary. At the opposite extreme from in-house decision making, some libraries present a flow chart to the binder at the outset of the business relationship. After it is discussed and found agreeable to both parties, the binder takes responsibility for making decisions based on the library's preferences. Arrangements in most institutions fall somewhere in between, with the library making decisions on some materials, and the binder on others. At the University of Connecticut, for example, the staff of the bindery preparation and conservation units make decisions on nearly all monographs and a select number of serials; the binder assumes responsibility for the remainder of the materials. The flow chart itself is articulated in as much detail as possible in the technical section of the library's binding contract.

Regardless of how a research library chooses to bind its collections based on the growing body of information available on this subject, it is essential that a plan for decision making be developed so that the binder can approach the work of the library with confidence, the library knows what to expect from the binder, and when differences of opinion arise there are guidelines to refer to. Such an approach can enhance an already good working relationship between binder and library, or can serve as the foundation for building one.

About the Author . . .

Jan Merrill-Oldham is Preservation Officer at the University of Connecticut, Storrs.

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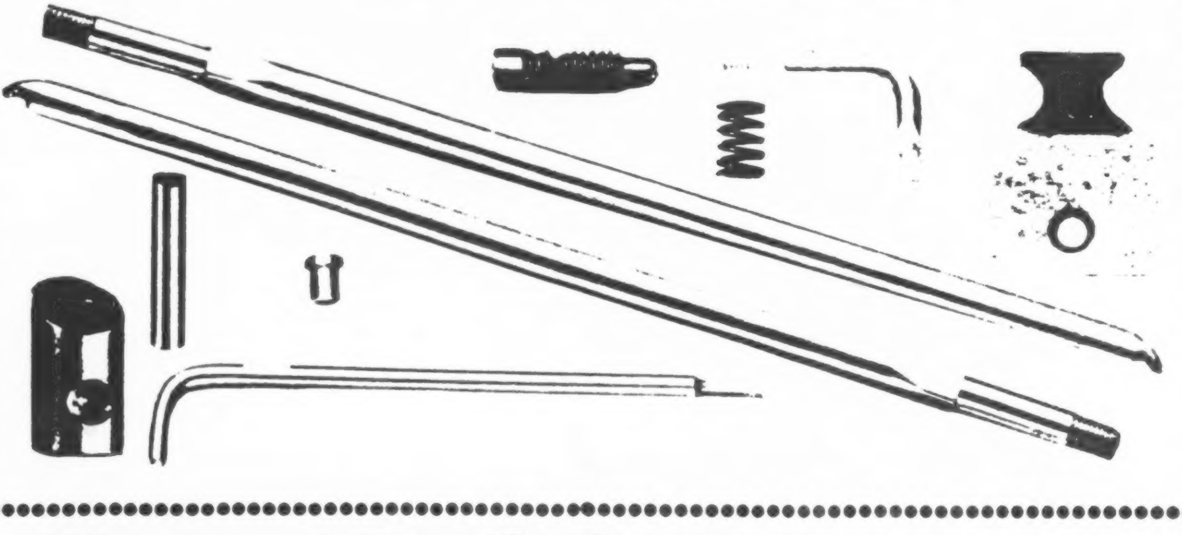

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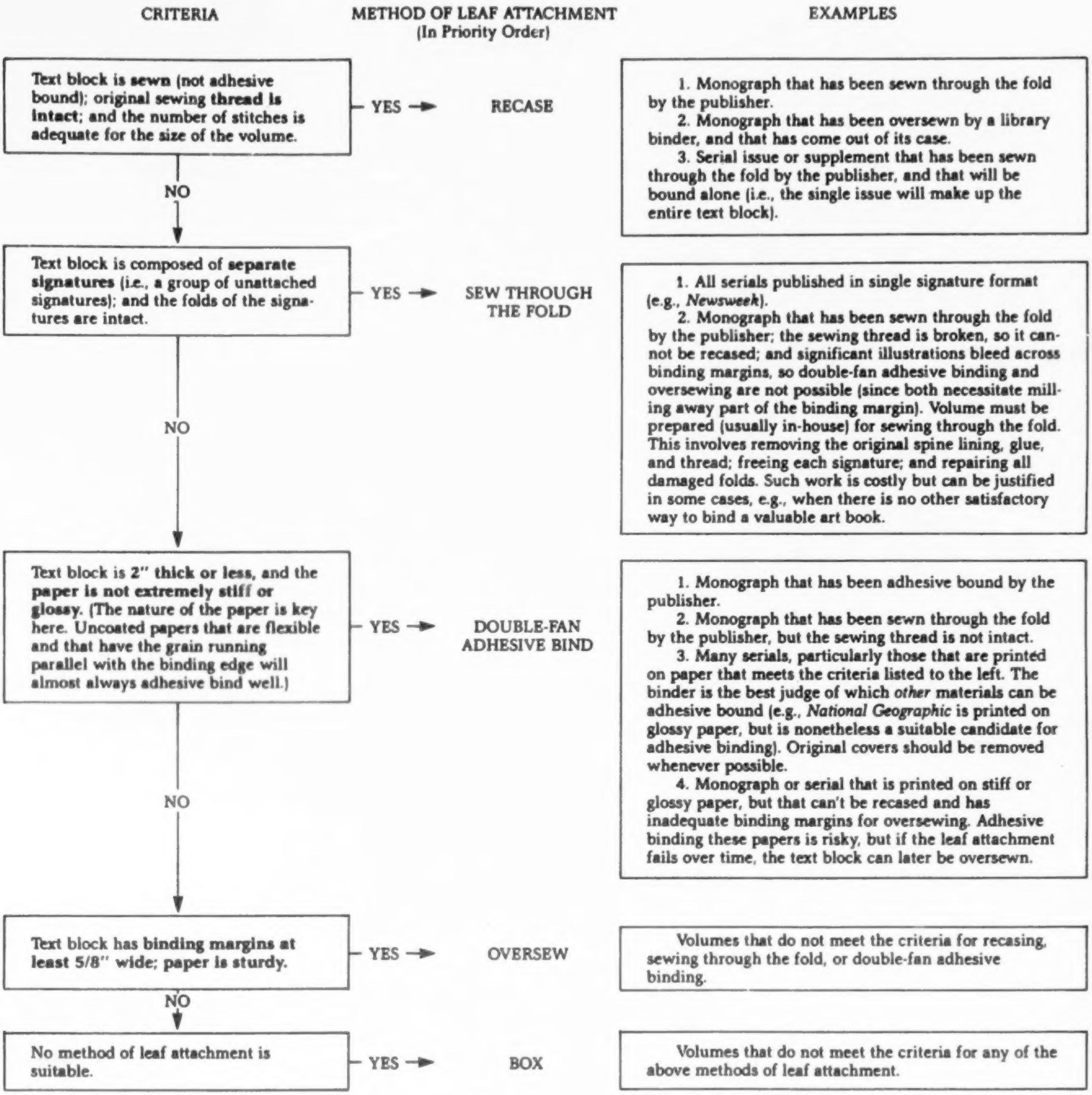
In August 1984, The New Library Scene ran an article by Jan Merrill-Oldham entitled *Binding for Research Libraries*. (Vol. 3, No. 4, page 1 and following). Since that time the author has revised the Sample Flow Chart that appeared on page 22 of that issue, so that terminology is consistent with the language used in the 1985 edition of the Library Binding Institute Standard for Library Binding (soon to be published). The revised flow chart includes expanded information in the criteria column, and a new section that cites examples of materials that meet those criteria.

METHOD OF LEAF ATTACHMENT: A DECISION TREE FOR LIBRARY BINDING UNIVERSITY OF CONNECTICUT LIBRARIES AT STORRS



CRITERIA	METHOD OF LEAF ATTACHMENT (In Priority Order)	EXAMPLES
Text block is **sewn** (not adhesive bound); original sewing **thread is intact**; and the number of stitches is adequate for the size of the volume.	RECASE	1. Monograph that has been sewn through the fold by the publisher. 2. Monograph that has been oversewn by a library binder, and that has come out of its case. 3. Serial issue or supplement that has been sewn through the fold by the publisher, and that will be bound alone (i.e., the single issue will make up the entire text block).
Text block is composed of **separate signatures** (i.e., a group of unattached signatures); and the folds of the signatures are intact.	SEW THROUGH THE FOLD	1. All serials published in single signature format (e.g., *Newsweek*). 2. Monograph that has been sewn through the fold by the publisher; the sewing thread is broken, so it cannot be recased; and significant illustrations bleed across binding margins, so double-fan adhesive binding and oversewing are not possible (since both necessitate milling away part of the binding margin). Volume must be prepared (usually in-house) for sewing through the fold. This involves removing the original spine lining, glue, and thread; freeing each signature; and repairing all damaged folds. Such work is costly but can be justified in some cases, e.g., when there is no other satisfactory way to bind a valuable art book.
Text block is **2" thick or less**, and the **paper is not extremely stiff or glossy**. (The nature of the paper is key here. Uncoated papers that are flexible and that have the grain running parallel with the binding edge will almost always adhesive bind well.)	DOUBLE-FAN ADHESIVE BIND	1. Monograph that has been adhesive bound by the publisher. 2. Monograph that has been sewn through the fold by the publisher, but the sewing thread is not intact. 3. Many serials, particularly those that are printed on paper that meets the criteria listed to the left. The binder is the best judge of which *other* materials can be adhesive bound (e.g., *National Geographic* is printed on glossy paper, but is nonetheless a suitable candidate for adhesive binding). Original covers should be removed whenever possible. 4. Monograph or serial that is printed on stiff or glossy paper, but that can't be recased and has inadequate binding margins for oversewing. Adhesive binding these papers is risky, but if the leaf attachment fails over time, the text block can later be oversewn.
Text block has **binding margins at least 5/8" wide; paper is sturdy.**	OVERSEW	Volumes that do not meet the criteria for recasing, sewing through the fold, or double-fan adhesive binding.
No method of leaf attachment is suitable.	BOX	Volumes that do not meet the criteria for any of the above methods of leaf attachment.

***Volumes printed on paper that has become brittle, and volumes having artifactual value, are inappropriate candidates for commercial library binding.**

Methods of Affixing Leaves: Options and Implications

By Paul A. Parisi
President, Acme Bookbinding Co., Inc.

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INTRODUCTION

For many years, oversewing has been called the cornerstone of library binding. Oversewing *does* provide an extremely strong, durable, and relatively economical method of leaf attachment. In fact, since oversewing has been recognized as the strongest method of affixing leaves, it is not surprising that many library binders have chosen oversewing as their preferred method of leaf attachment.

It is unreasonable, however, for anyone to claim that oversewing is the best or only method of leaf attachment to be used in quality binding. The premise that strength and quality are synonymous loses validity, if one recognizes that strength must be traded off against flexibility, to allow effective use of the book. This point is especially relevant when poor quality papers or narrow margins are involved.

This is not to say that oversewing is *not* a good choice. On the contrary, oversewing is an excellent method of leaf attachment, as long as the paper condition is good and the inner margin is adequate. The argument for oversewing is even more persuasive if the book is expected to circulate frequently.

The strength, assurance of secure attachment of all pages, and relative cost advantages (as compared to other sewing techniques) will always insure that oversewing remains a necessary and significant option for both the library binder and the customer. The important question, though, is how much strength *does* one need and when is strength the first priority? It's important to note that the full assortment of leaf attachment techniques available must be utilized to solve the many binding problems we face. Machine sewing, centerfold sewing, and adhesive binding are several of the tools available to do the job.

BEFORE SELECTING A BINDING METHOD

Prior to the selection of any binding method, each book should be screened thoroughly, taking into account the following factors:

1) paper quality;
2) width of inner margin;
3) presence of an acceptable sewing structure; and
4) format of the leaves (i.e., single sheets or folded sections).

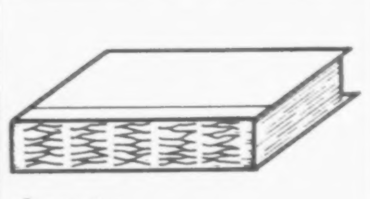
Once this examination has been made, a leaf attachment method can be chosen that will not only allow the bound book to be read and copied comfortably, but will still leave it as strong as possible. Whether concerned with new books, rebinds, or periodicals, the customer and binder *together* must determine who is best qualified to assume the responsibility for this screening and clearly defined guidelines must be mutually agreed upon. Both parties need to consider the assets and liabilities of each option, including:

1) openability of the book;
2) necessary spine infringement;
3) relative cost;
4) ability to copy pages;
5) strength of the resulting binding, and
6) options for rebinding.

In particular, the expected use of the book and the cost constraints imposed by the customer are major concerns which must be immediately identified so that a proper binding selection can be made.

REVIEWING THE OPTIONS

Let's look at eight different methods of leaf attachment: six options involving sewing and two utilizing adhesives.



Oversewing

Options Using Sewing

1) One of the most familiar methods of leaf attachment is **OVERSEWING.** Machine oversewing was first introduced in 1920 and has since become the primary method of leaf attachment used by library binders. This method requires that each book be divided into small sections of individual pages or leaves. Often, this is accomplished by milling or cutting the spine of each book to remove the glue and/or original sewing. In some cases, a binder may elect to take a book apart by hand with a knife. This operation accomplishes the task of dividing the book into small sections (approximately 15–20 pages each) without loss of inner margins and generally results in an extra charge. Books receiving normal spine preparation on a milling machine lose up to 1/8 inch of their inner margin. Precautions must be taken to insure that all books designated for oversewing have remaining inner margins (after spine milling) which equal or exceed 1/2 inch. After spine preparation, the books are ready for the oversewing process. Sections of the book are placed into the machine at a 45° angle and are then clamped. Vertical punches (spaced 1 inch apart) punch holes through the pages of each section. Threaded needles pass through the punched holes, enter through the spine, and exit the section approximately 3/16 inch in from the back edge of the page. Horizontal shuttle needles then pass through each of the separately formed thread loops and complete the stitch. The process is repeated to form successive lock stitches up the spine of the book.

Major Advantages of Oversewing:

—Versatility . . . any book up to a 15 inch height, unlimited width, and five inch thickness can be oversewn.

—Strength . . . the lock stitch sewing provides exceptional strength.

Major Disadvantages of Oversewing:

—Perforation of pages inherent to the process can (and will) damage poor quality paper.

—Rebinding a book once oversewn necessitates either butting off 1/4 inch from the spine or manually taking the sewing apart. This is rarely necessary because of breakdown of the sewing structure, but may be required for other reasons, such as book mutilation or insertion of missing issues (with periodicals).

2) Another method of affixing leaves is **HAND CENTERFOLD SEWING.** This technique has been used with great success for centuries and has few (if any) disadvantages, other than its relative cost. The process requires that the pages of the book to be sewn are in folded (or signature) form. Hand sewing is accomplished by passing a threaded needle through a hole in the folded section of paper, starting from the outside (or back edge) of the signature. The needle draws the thread along the fold, parallel to the

spine, and passes it back out through another hole. After looping around a cord or tape, the needle passes back into the folded signature through yet another hole and the process is repeated until the full length of the spine is sewn. The beginning and end of each signature are tied off with a kettle stitch to attach the signature at hand to the one previously sewn. This entire process is repeated for each additional signature. The last section is the endsheet, which is comprised of two folded sheets with a cloth reinforcement strip at the fold of the outer sheet. The cloth reinforcing strip is usually attached only to the outside edge of the fold and extends 1/4 inch beyond that fold. This free cloth extension can be tipped to the adjacent page of text, thereby providing a hinge between the text block and endsheet. After sewing, cords or tapes are cut off approximately 1 inch beyond each side of the spine and are glued down securely with adhesive. When hand sewing, it is possible to have sections of pages that are comprised of single sheets, as well as folded signatures. These are sewn together through the side, similar to oversewing. The sewer can alternate within a single book between sewing through-the-fold and sewing through the side, as necessitated by the material at hand.

Major Advantages of Hand Centerfold Sewing:

—No spine milling is necessary.

—Completely flat opening, allowing both easy reading and copying of text that runs near or across the center fold.

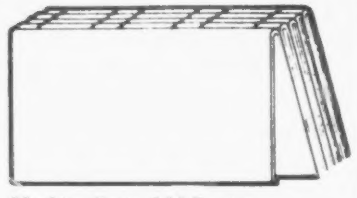
—Only minimal spine damage is caused by hand sewing. The center fold attachment of pages results in minimal stress placed on the pages when reading. This method is considered gentle to the book and should lengthen its life.

Major Disadvantages of Hand Centerfold Sewing:

—It is a slow hand process that is unavoidably expensive. As a result, cost conscious customers cannot always justify hand sewing for all materials.

—Fewer and fewer books are printed in signature form, thereby eliminating this option from the range of potential leaf attachment alternatives in many cases.

3) Another method is **MACHINE CENTERFOLD SEWING.** The machine most commonly used in library binderies for centerfold sewing is the Smyth-National sewing machine. The Smyth-National is a modified edition bindery machine, which can better accommodate the wide variety of different materials processed in a library bindery each day. Its operation in many ways duplicates that of hand sewing, with the major difference being that the book is sewn with multiple sewing heads, simultaneously sewing each folded section. Rather than having a long series of continuous horizontal stitches through the fold of each section, there is an independent series of stitches formed within each signature and connected vertically between signatures.



Machine Centerfold Sewing

Major Advantages of Machine Centerfold Sewing:

—Lower cost, relative to hand sewing.

—All other advantages of hand sewing apply.

Major Disadvantages of Machine Centerfold Sewing:

—Most machines have constraints not encountered when sewing by hand. For example, the machine cannot sew folded sections that are less than three folded sheets (or more than approximately 1/4 inch thick).

—No machine can sew a combination of single sheets and folded signatures.

4) The next method to be discussed is **NEW CASE ONLY, RECASE or RETAINED BINDING.** This method is generally chosen for books where the original sewing remains intact and it usually applies only to books that are complete in one piece. After removing the original cover, the old backlining and the old glue, it is possible to inspect the sewing to determine if it is still sound. Proper spine penetration is essential. In publishers' bindings, animal glues are often used on the spines because of their compatibility with high speed, automated binding processes. Unfortunately, animal glue becomes brittle with age and does not enhance the quality of the Smyth sewing that it is often used in conjunction with. After the spine has been cleaned, defects in the sewing (which were covered by the old glue and spine lining) become apparent. At this point, a book with unsound sewing would be rerouted to one of the other leaf attachment work stations. Books that are sound have new endsheets attached, get a coat of specially-formulated, polyvinyl acetate (PVA) emulsion glue, and a new backing is applied to the spine. The PVA glue does not lose its flexibility with age and improves the binding by holding the sewn signatures securely together. New endsheets are attached, via one of several methods. First, there is the *stab sewing process*. New endsheets are sewn onto the text block by passing a threaded needle through the tab of an oversewn endsheet, then through the book, at approximately a 45 ° angle. The needle then passes back through the spine and out through the endsheet. This process is repeated down the length of the spine and back again so that the stitch can be tied off. An attempt should be made to vary the angle of penetration and the exit and entrance locations along the spine, so as to reduce the stress to any one part of the spine. The endsheet is folded back onto itself to cover the sewing and to provide a hinge which is even with the back edge of the book. Although this method does preserve the original centerfold sewing, in effect, it oversews the first and last sections of the book and introduces all of the drawbacks of oversewing — without the cost reduction of a machine operation. *A second method utilizes specially-designed, but commercially available, endsheets.* This technique uses the same process as the Smyth-National sewing method does, but is performed with a hand operation. A threaded needle is passed into and out of the last secure section of the text block, leaving a loop extending at each point of entry into the signature. The entrance and exit locations of the needle through each signature must align vertically so that the loops left from the previous signature can be sewn through and drawn tight, thus forming a series of connections between signatures. This process is repeated for each signature added. The endsheet is sewn on in exactly the same way and the cloth extension is tipped down to the adjacent page of the previous signature. This forms an unrestricted cloth hinge between text block and endsheet.

Major Advantages of New Case Only:

—Books with narrow margins, poor paper quality or intrinsic value can be rebound in a non-damaging way that utilizes the existing sewing.

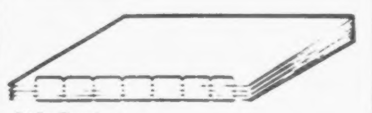
—Books will open easily, both for reading and copying.

—This method is less expensive than

hand sewing, but produces the same results.

Major Disadvantages of New Case Only:

- —Much handwork is involved and, therefore, extra charges are incurred.
- —The binding is only as good as its original sewing and cannot be expected to be as durable as bindery centerfold sewing.



Side Sewing

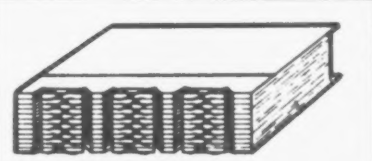
5) Yet another option is **SIDE SEWING** (also known as **SINGER SEWING**). This method is not used extensively by library binders because of mechanical and functional limitations. The side sewing process sews books through the side with a chain stitch, much the same as a conventional sewing machine sews clothing. Unlike other sewing methods, the side sewing method sews the entire book as one section. A threaded needle enters the side of the book at a 90 degree angle and exits through the bottom of the book, where the stitch is caught by a bobbin thread.

Major Advantages of Side Sewing:

Exceptionally strong.

Major Disadvantages of Side Sewing:

- —Limits the openability of the book.
- —Books must have inner margins of more than 1 inch and must be no more than ½ inch thick.



Cleat Laced Binding

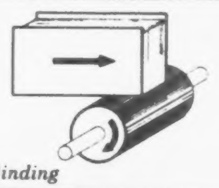
6) One last method in this category is **CLEAT LACED BINDING.** It is generally regarded as a technique to be used only for storage bindings and books where durability is not critical. Cleat laced binding (like oversewing) requires that the spine first be cut to separate the book into single sheets. Next, parallel slits or cleats are cut into the backbone of the book by circular saws at opposed angles. These cleats intrude into the spine approximately ⅛ inch. A thread carrier then separates thin sections of the spine to lace a pasted thread around the cleats in a figure-eight pattern. The final strength of this process is achieved only when the spine is coated with PVA adhesive.

Major Advantages of Cleat Laced Binding:

- —It is a faster and simpler method of leaf attachment and should provide a less expensive alternative to other sewing options.
- —Openability is somewhat better than with oversewing and side sewing, but not as good as with some of the other methods mentioned.

Major Disadvantages of Cleat Laced Binding:

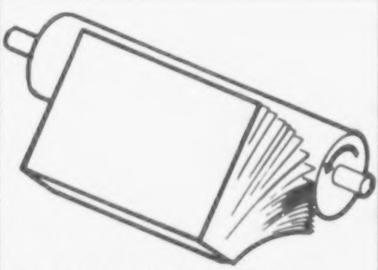
- —Essentially the same spine loss is incurred as in oversewing . . . ⅛ inch for milling and ⅛ inch for the cleats.
- —Testing has shown that strength and durability are inferior to oversewing and double fan adhesive binding, especially in the front and back sections of the text block.
- —Rebinding requires cutting off an additional ¼ inch to duplicate the cleat laced process.



Perfect Binding

Options Using Adhesive

Adhesive binding, as it is done today in the library bindery, should not be confused with "perfect binding" as done in the edition bindery. Although it is fast and inexpensive, "perfect binding" (which is really a misnomer) is subject to failure with age and use. Other types of adhesive binding do not share the disadvantags of "perfect binding" or the lower cost relative to sewing and, therefore, should not share their negative connotations.



Double Fan Adhesive Binding

1) **DOUBLE FAN ADHESIVE BINDING** is the technique used by most library binders, utilizing either the Ehlermann Double Fan Binding Machine or a similar hand process. This process requires that the spine of the book first be milled to remove glue and/or sewing from the text block. It is essential that the milling operation cuts the spine of the book, so that each and every page of the book is flush. After milling, a fanning clamp grips the book and later, the milling clamp is released. This double clamp process (made possible with the uses of the Ehlermann Machine) insures that the alignment of pages created by the milling process is not disturbed when the book is transferred to the gluing station. After making sure that all of the pages of the book are separated and free to fan independently over the glue roller, the next step begins. The double fanning operation first fans the book down over a glue roller which applies a thin line of PVA adhesive to each and every page as it "fans" free over the roller. This penetration of adhesive between pages (approximately ten thousands of an inch) actually tips one page to another. At the end of the downward cycle, the process is repeated in reverse. Some binders fan each book twice. In effect, they produce a double-double fan binding. Each side of each page would fan over the glue roller twice, for a combined total of four applications of glue for each individual page. Following the spine fanning and gluing, a piece of stretch-cloth back lining is applied to the spine, extending to the front and back endsheets. This back lining covers the glued spine and enables the operator to remove the book from the machine clamp without disturbing the page attachment. The normal drying period should be at least several hours before any further handling takes place. Double fan binding demands careful attention to the alignment of the pages after milling and prior to fanning. If a page is not jogged flush to the surface of the spine, it will not touch the glue roller and, thus, will not be bonded. Just as important is the quality of the glue used in the process. Since the adhesive is all that holds the page to the book, it makes sense to use the best product available. The PVA products which have earned this distinction are of German manufacture and, to date, have not been duplicated or improved on domestically.

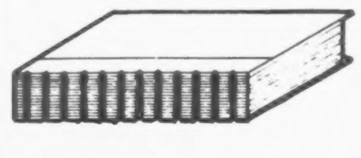
Major Advantages of Double Fan Adhesive Binding:

- —Completely flat openability of the book, allowing both easy reading and copying, regardless of margin.

- —Very little spine milling is required, therefore allowing rebinding with minimal difficulty.
- —Strength is unusually good, especially if the paper stock is anything other than heavily coated paper.

Major Disadvantages of Double Fan Adhesive Binding:

- —Books in signature form must have the spine folds cut prior to fanning. For thick signature books, the necessary cuts may have to be quite wide.
- —Heavily coated papers do not allow the adhesive to penetrate into the paper fibers and the resulting bond is less strong.



Mekanotch Binding

2) One other method of leaf attachment employing adhesives is **MEKANOTCH BINDING.** The Mekanotch machine has been successfully used in Europe for close to a decade, but is just now being introduced into library binding in the U.S. The Mekanotch machine cuts thin slits in adjustable patterns and (more importantly) in adjustable depths of penetration into the spine of the text block. This notched pattern prepares the spine for optimum linkage between paper and PVA adhesives by increasing the surface area which the glue will come in contact with. Deeper notches, although they allow greater adhesive penetration and strength, will result in a book that is more difficult to open. The trade-off between strength and flexibility cannot be ignored. The notched pattern can and should be adjusted for maximum advantage. Notched Binding can be a stand alone process. After notching and spine milling, the book can be glued with PVA adhesive for an acceptable quality binding. Special care must be taken to insure that PVA adhesive is forced into all of the notches. It is important to note that notched binding as a stand alone process is, as yet, untested and cannot be recommended for permanent library materials.

The Mekanotch process can also be used in conjunction with double fan adhesive binding to produce optimum strength and flexibility. In the past, problems such as incorrect paper grain reduction, stiff paper, and heavily coated paper have made many binders reluctant to choose adhesive binding, when margins are narrow. Mekanotching, for the first time, allows the binder to control spine preparation to the extent that any book can be adhesive bound with confidence. The notches cut into the spine of the book are quite thin. These notches can be spaced at varying intervals to either maximize strength or minimize paper damage. The combination of individually tipped together pages and greater spine contact with adhesive will result in an adhesive binding superior to any other now available.

Major Advantages of Mekanotch Binding:

- –Especially when used with double fan adhesive binding, can provide strong and flexible bindings regardless of margin.
- –Notch depth and spacing are adjustable, meaning that binder can control spine preparation, minimizing damage and maximizing strength as desired.

Major Disadvantages of Mekanotch Binding:

- –Since it is new to the U.S., not yet available in many binderies.
- –The greater the linkage between the paper and the PVA adhesives, the more flexibility is sacrificed. Binder must use reasonable judgment in determining depth of notches.

CONCLUSION

Now that you have had the chance to review brief explanations of eight complex, technical methods of leaf attachment, you can better understand how difficult it is for library binders to strike a balance between acceptable quality and customer-imposed cost constraints. Full implementation of the procedures outlined on these pages require that the binder:

- –Maintain an inventory of up to four different types of endsheets;
- –screen incoming books to determine the appropriate method of attaching leaves;
- –route books to the various selected work stations; and
- –reassemble the books into a complete job lot before moving them to the next stage of production.

This routine requires considerable effort by the binder. Even if the customer is willing and able to indicate the leaf attachment desired for each book sent to the binder, someone at the bindery must reevaluate that decision. This is because it is not always possible to determine the strength of an existing sewing structure in a book until the old cover is removed and the spine is cleaned. Wire staples and previous leaf attachment treatments often make it difficult to determine the width of the inner margins.

Also, it's important to remember that although the primary function of a binding is to hold the pages together within their protective cover, allowing convenient storage and easy access to the printed text, factors beyond the control of the customer and binder often make it impossible to find one single solution to the problem of how best to attach leaves. Fortunately, library binders have the expertise, the facilities, and the commitment to successfully utilize a variety of techniques, balancing quality, strength, and cost. The customer and the binder should mutually determine a leaf attachment guideline that considers:

- –paper quality and available inner margins for each volume;
- –what margin breakpoints will be for each method;
- –what book's ultimate use will be;
- –what the customer can afford in each case; and
- –what charges will be incurred for hand work, if necessary.

An initial guideline for selection of possible methods could be as follows:

1) Any book with up to ½ inch inner margin could be:
   A. New Cased Only if possible (extra charge);
   B. Centerfold Sewn, (extra charge);
   or
   C. Double fan adhesive bound with spine notching.

2) Any book with over ½ inch inner margin could be:
   A. New Cased Only if possible (extra charge) . . . recommended for poor paper or valuable books;
   B. Centerfold Sewn (extra charge) . . . recommended for poor paper books, books with thick signatures, or valuable books;
   C. Oversewn (if paper condition permits) . . . recommended for heavily circulated books; or
   D. Double fan adhesive bound with spine notching.

Books foster communication between strangers, but binders and their customers are not strangers and should not treat each other as such. It's vital that a continuing dialogue be maintained, so that the best possible binding decisions can be developed. Hopefully, this information will help to assist such a process.

Photographs

From HISTORY NEWS, October 1980.

CONSERVA-TIPS

Paper and Plastic Preservers for Photographic Prints and Negatives

The following discussion of the care and storage of photographic materials covers materials and techniques that may be used to store photographic prints and negatives. This article does not include information on why such steps must be taken to preserve photographic materials. If you need a review of basic conservation information, consult the books listed at the end of this article.

BY MARGARET HOBBIE

Historical photographs and negatives must be protected from light, dust, and pollutants, extremes of relative humidity and temperature, surface scratches, and tears. This protection may be provided by careful handling, climate control, sturdy boxes and shelves made of inert materials, and by "preservers"—envelopes, sleeves, and folders. This article provides a review of the various types of preservers available to you.

The ideal preserver covers the print or negative completely, protecting it from damage by dust. It is opaque, providing protection from light, yet it is also transparent so that the image can be seen without having to remove the print or negative from its covering. The ideal preserver is stiff, reducing the incidence of tears. It is porous, preventing the build up of gases and moisture that cause ferrotyping, or spotting, of the emulsion. The ideal preserver is made of a neutral plastic or acid-free paper, materials that do not add acids to the already acidic prints. The surface of the ideal preserver can be written on. It is inexpensive and easy to obtain.

An opaque, transparent, stiff, neutral, inexpensive preserver that also can be written on does not exist. Photographic curators must do the best they can with available methods. The following list compares several preservers' desirable and undesirable traits and costs. Carefully consider each option with reference to your budget, available space, and the importance of the photo collection. The costs indicated are estimates for storing one-hundred eight-by-ten-inch black-and-white prints or negatives.

Paper methods

Paper preservers are porous and do not trap dangerous gases and moisture that affect prints and negatives. They are opaque and protect materials stored within from light damage. Acid-free, buffered paper envelopes—like Permatan—retard the deterioration of photographic paper and images. Their seams are sealed with non-acidic adhesives. If you are storing negatives in paper preservers, be sure to insert them with the emulsion sides away from the seam.

Buffered paper should not be used with stabilized color film. Some conservators question any use of buffered paper because the long-term effects of the calcium carbonate buffer on photographic emulsions are not known. Another disadvantage of paper preservers in general is that the photo or negative inside must be removed to be examined. The piece will suffer damage, however slight, each time it is removed from the preserver and re-inserted.

Paper methods are preferred to plastic for negative storage. To reduce the handling of negatives, make copy prints of your negative collection for reference purposes.

Matting ($50-$55). If you choose to mat your photographic prints, mount them on acid-free, two- or four-ply boards with rice paper and wheat paste or Holland tape hinges. Also use a translucent or transparent overlay sheet of acid-free glassine, polyester, or tissue. Store matted prints in flat shallow boxes.

Advantages. Matting a print keeps it flat, stiff, and easy to handle. In this form, it is ready to exhibit. Notes can be written on the back of the mounting board in pencil. The overlay tissue, glassine, or polyester protects the print from dust. The mat is porous, so humidity should not be a problem.

Disadvantages. Matting is not the most expensive storage method, but it does require the most work. For this reason, it is inappropriate for most historical agencies. The process of hinging the window mat and the print to the backboard involves the use of hygroscopic wheat paste or adhesives. These materials may cause the prints to pucker and may attract insects. The calcium carbonate buffer used in acid-free paper eventually may damage the prints.

Acid-free paper envelopes ($13-$16). Acid-free paper, sometimes called Permatan, alkaline, or high pH paper, has had harmful acids removed and is buffered with calcium carbonate to retard its absorbing acids from adjacent materials. It has a pH of at least 7.0. Seams of envelopes made with acid-free paper are sealed with acid-free adhesives.

Advantages. Acid-free envelopes are stiff, porous, can be written on, and offer protection from dust. Envelopes with a thumb cut instead of a flap are suitable for storage of glass plate and celluloid negatives.

Disadvantages. Paper envelopes are not transparent; the material stored inside must be removed for examination. The envelopes' seams may buckle and create an uneven surface upon which the print or negative rests. This could mar the material. The calcium carbonate buffer eventually may cause problems.

Acid-free paper envelopes with plastic sleeves ($16-$60). This system combines the advantages of transparent and

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Margaret Hobbie is the consultant at the Regional Conference of Historical Agencies in Manlius, New York. This article is reprinted from the August issue of RCHA's newsletter where it appeared as RCHA Technical Leaflet #55.

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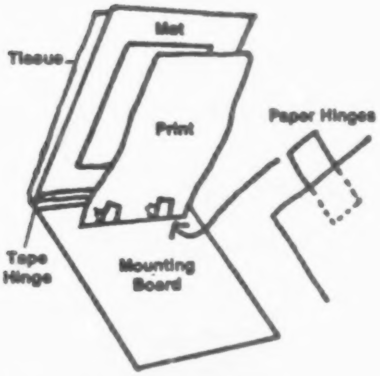

A properly matted photograph.

opaque preservers. The print or negative is placed inside a transparent plastic—polyester, polyethylene, or triacetate—preserver, which is then inserted into the paper envelope.

Advantages. This combination offers protection from damage caused by handling, dust, light, and sagging. Notes may be written on the paper envelope.

Disadvantages. This system requires more work than either a plastic or paper system alone. The inner plastic sleeve is not very porous, and the seams of the acetate, polyester, or triacetate sleeves and the paper envelopes create an uneven surface.

Acid-free paper folders ($12). These folders are closed on one side. They are commonly available in letter and legal sizes. Larger sizes may be specially ordered. These folders may be stored vertically in metal file cabinets.

Advantages. These folders are porous and can be written on.

Disadvantages. The photograph must be supported well if filed vertically to prevent sagging and curling. Prints should be stored one per folder or no more than six per folder if acid-free paper interleaves are used (see below). Folders alone offer no dust protection. Prints must be removed from the folder for examination. The calcium carbonate buffer may damage the print eventually. This method is *not* appropriate for storing negatives.

Acid-free paper folders with acid free interleaves ($4). You can store more than one print per folder if you separate the prints with acid-free interleaves such as Permalife paper, barrier board, or tissue. No more than six prints should be filed in one folder.

Advantages. The folder is porous and can be written on.

Disadvantages. The photos must be supported well or they will sag and curl. There is no protection from damage caused by dust or excessive handling. Again, the calcium carbonate buffer may cause problems. This method is *not* suitable for storing negatives.

Kraft paper and glassine envelopes. Kraft paper and glassine are highly acidic and are considered inappropriate for long-term storage of historical photographs.

Plastic methods

Polyester, polyethylene, and triacetate are all inert plastics that are suitable for enclosing photographic prints. The great advantage of plastic preservers is that they allow examination of an image while it is enclosed, thus decreasing the damage caused by handling. They offer protection from dust, but not from light. In storage areas where high humidity is a problem, plastics can cause ferrotyping, or spotting, of the image by trapping moisture inside the preserver. The plastics described here are all flimsy and generally require additional support. The long-range effects of plastic on prints are not known, and any of the methods described below may prove to be inadequate after the passage of several years. In general, plastic should *not* be used to enclose negatives; nitrate negatives *never* should be enclosed in plastic.

Polyester envelopes or sleeves ($60-$80). Polyester, also called mylar, is stronger than polyethylene and triacetate. Inert polyester does not contain acids.

Advantages. Polyester is transparent and protects the image from damage caused by handling. It keeps out dust and is fairly stiff. In some cases an additional support may be necessary.

Disadvantages. Polyester is not porous, so high relative humidity in the storage area may cause problems. It cannot be written on. In dry conditions, it may create a static electrical charge that can

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lift particles of the emulsion off the print and attract dust.

Polyester folders or encapsulation ($25-$35). Polyester folders are creased at one side or sealed with acid-free tape. Very thin prints are held in place by static electricity. Encapsulation involves enclosing the print between two sheets of polyester sealed on all four sides with double-stick, acid-free tape. Encapsulation is an excellent process for storing and exhibiting very fragile prints.

Advantages. This system is stiff and transparent, reducing damage from handling and tears. Encapsulated prints are easy to mat and exhibit.

Disadvantages. These options require a good deal of work. Other disadvantages include those listed above for polyester envelopes and sleeves.

Polyethylene envelopes ($3). These envelopes have a heat-sealed seam.

Advantages. Polyethylene envelopes offer protection from dust and excessive handling. The heat-sealed seam is at the side, so neither adhesives nor uneven thicknesses present problems.

Disadvantages. Polyethylene envelopes are very pliable and need additional support. They are not porous and cannot be written on. They are more likely than polyester and triacetate envelopes to cloud and show scratches.

Polyethylene envelopes with bristol board supports ($8). This method calls for regular polyethelene envelopes with inserts of bristol board, barrier boards, or two-ply acid-free mat boards cut slightly smaller than the envelope.

Advantages. This combination offers dust protection, support, and transparency. Notes may be written on the back of the support board.

Disadvantages. Polyethylene is not porous so moisture may build up inside the preserver in humid storage areas. This method requires much time and labor for cutting the support boards to fit inside the envelopes.

Triacetate envelopes or sleeves ($22). These envelopes or sleeves are made from inert plastic. They are transparent and quite stiff. Triacetate is stronger than polyethylene but not as strong as polyester.

Advantages. Triacetate envelopes are transparent and reduce damage that may be caused by handling. They are stiff enough so that support boards are not necessary for thin photographs.

Disadvantages. Triacetate envelopes are not porous, so moisture may build up inside the envelopes in storage areas where high humidity is a problem. Static electricity created by the triacetate in dry conditions may attract dust and harm emulsions. The surface of the envelopes or sleeves cannot be written on.

Triacetate envelopes or sleeves with bristol board supports ($27). This method uses inert triacetate with inserts of bristol board, barrier board, or two-ply acid-free mat board cut slightly smaller than the envelopes or sleeve.

Advantages. This system offers dust protection, support, and transparency. Notes may be written on the back of the support boards.

Disadvantages. Triacetate is not porous. Labor is involved in cutting the support boards to fit inside the sleeve or envelopes.

Tyvek envelopes ($40-$75). Tyvek is a Dupont olefin made by bonding virgin polyethylene fibers into opaque white sheets. Envelopes may be purchased ready to fold or made up with flaps and seams sealed with acid-free adhesives.

Advantages. Tyvek envelopes are opaque, porous, and can be written on. They are suitable for storing glass, paper, color, polyester, and triacetate-based negatives.

Disadvantages. Materials stored inside Tyvek envelopes must be removed for examination. The seams in some brands of envelopes create uneven surfaces. An insert support board is necessary in many cases.

Sources of supplies

Suppliers' catalogues are a good source of information, and usually they are free. Many manufacturers offer modifications and elaborations of storage systems described above.

- *Conservation Resources International*
111 North Royal Street
Alexandria, Virginia 22314
703-549-6610
Folders, bond, polyester folders, encapsulation materials, Tyvek envelopes
- *Gaylord Bros., Inc.*
7272 Morgan Road
Syracuse, New York 13201
315-457-5070
Paper envelopes, polyester folders, encapsulation materials
- *The Hollinger Corporation*
P. O. Box 6185
3810 South Four Mile Run Drive
Arlington, Virginia 22206
703-671-6600
Matting materials, paper envelopes and folders, bond, polyester sleeves, encapsulation materials
- *Eastman Kodak Company*
Rochester, New York 14650
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Fenton, Missouri 63026
Slide storage and viewing systems, viewer editors

■ *Nelson Exchange*
P. O. Box 447
Pleasantville, New York 10570
Polyethylene envelopes in fifty-three sizes

■ *Photofile*
2000 Lewis Avenue
Zion, Illinois 60099
312-872-7557
Acid free paper, envelopes, and folders, polyester binders, mylar sleeves, photo file cards

■ *Process Materials Corporation*
301 Veterans Boulevard
Rutherford, New Jersey 07070
201-935-2900
Matting materials, bristol board, polyester film

■ *Talas*
Technical Library Service
104 Fifth Avenue
New York, New York 10011
212-675-0718
Matting materials, paper envelopes and folders, polyester envelopes and sheets, polyethylene envelopes.

■ *University Products, Inc.*
P. O. Box 101
South Canal Street
Holyoke, Massachusetts 01040
800-628-1912
Matting materials, paper envelopes and folders, bristol board, encapsulation materials

Recommended reading

Eastman Kodak Company. *Preservation of Photographs.* Rochester, New York: Eastman Kodak Company, 1980. (Kodak Publication No. F-30, $5.50).

Remple, Siegfried. *The Care of Black and White Photographic Collections: Identification of Processes.* Ottawa: Canadian Conservation Institute, 1979. (Technical Bulletin No. 6, available free from the Canadian Conservation Institute, National Museums of Canada, Ottawa, Ontario K1A OM8).

Weinstein, Robert A., and Larry Booth. *Collection, Use, and Care of Historical Photographs.* Nashville: American Association for State and Local History, 1977. ($16 for nonmembers, $10.50 for members.) HN

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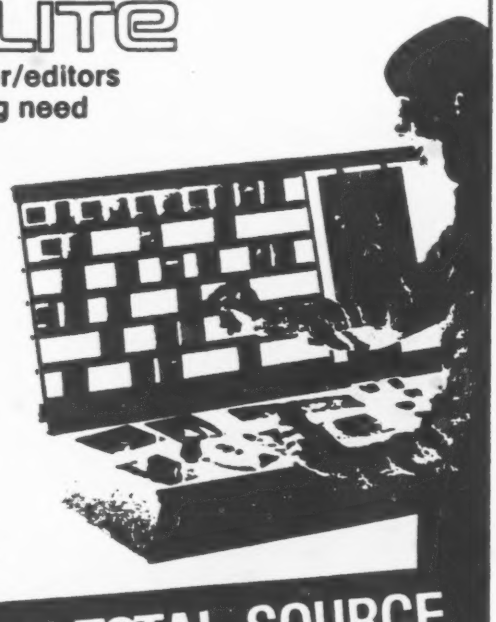

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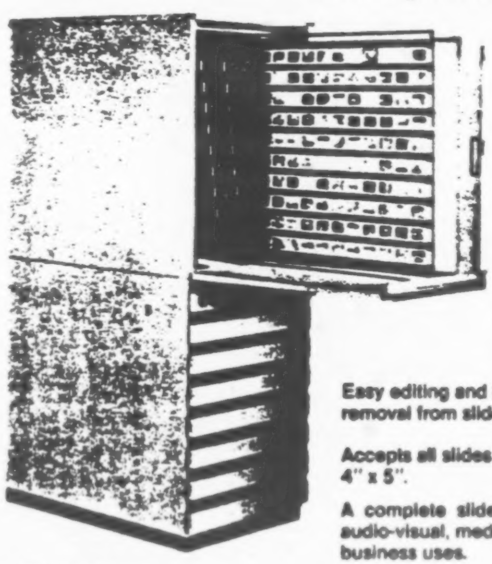

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RECOMMENDED STORAGE PROCEDURES FOR PHOTOGRAPHIC COLLECTIONS

Proper environmental controls, careful choice of storage and labeling materials, and careful handling of the objects will minimize possible chemical and mechanical damage to a photographic collection.

The recommended humidity range for the storage of most materials is 55-65%. Photographs are best stored and displayed at even lower relative humidities--50% or less. Avoid extremely humid conditions. Such a humid environment may encourage mold growth in proteinaeous photographic emulsions (such as albumen or gelatin) causing deterioration and increasing solubility of the emulsion. Photographs housed face to face may adhere to one another. This problem is compounded with higher temperatures. Low relative humidity must also be avoided. Under dry conditions gelatin and albumen emulsions may crack or craze and become brittle, possibly leading to flaking of the photographic image.

High temperature can accelerate the natural degredation process. (Every 10°C rise in temperature will double the chemical reaction rate.) The recommended storage temperature for photographic materials (excluding color materials) is 50-60°F. It is important that the temperature remain constant. Extreme changes in temperature will cause expansion and contraction of many photographic materials.

Because many photographic images contain silver, they are very sensitive to the presence of sulphur. Therefore, sulphur containing rubbers, latexs, and other synthetic materials must not be used and/or stored near these objects.

Storage furniture should not be made of materials which are harmful to photographs. Baked-on enameled steel cases are better than wood and acid-free cardboard boxes should be used at all times.

Finally, the storage area should be kept dark to eliminate deterioration by light. Keep all forms of ultra-violet radiation away from photographic images. Cyannotypes, Calotypes, Salted Paper Prints, and hand-colored images are especially susceptible to fading.

Cased Objects (Daguerreotypes, Ambrotypes, and Tintypes)

It is difficult to propose ideal environmental conditions for cased objects because they are composed of a variety of materials. A relative humidity of about 40-50% and temperature of 65-68°F is usually recommended as a safe median for most materials.

The glasses used as glazing materials or actual supports for these photographic images are often chemically unstable due to an uneven distribution of salts within the glass structure. Such potentially unstable glass should not be stored in high relative humidity conditions. In addition, brass mats, preservers, and tintypes are prone to deterioration by corrosion at high relative humidity.

Leather, paper, and wood may become embrittled and cracked if stored in very dry conditions. Such conditions may contribute to major structural changes and deformations of the case.

The bright silver surface of daguerreotype plates is extremely susceptible to tarnishing. The tarnish (Ag_2S) may cover the entire plate or may center at the window opening of the brass mat. Sulphur containing materials must therefore be avoided.

Cased objects should be stored in fabricated acid-free jackets (see instruction sheet, Appendix I) with identifying information written in pencil on the outside of the jacket. If possible a 35mm contact print of the photographic image should be attached to the outside of the jacket. These objects in jackets may be stored in acid-free boxes or flat in drawers.

Ambrotypes, tintypes, and daguerreotypes which lack cases may be stored in acid-free envelopes, with pertinent information written on the outside of the envelope.

All cased objects are very fragile and must be handled with care. When viewing an image do not open the case completely as this may cause undo stress on the hinge, possibly cracking and/or breaking it completely. If the case is warped locking the case may break the spine. Frequently, it is better not to use the clasps as they tend to abrade the surrounding leather or paper on the case.

Unmounted Photographs (Albumen, Collodion, Gelatin, Salted Paper, Platinum, etc.)

Photographs should be stored in non-hygroscopic containers which are free of sulphur, acids, and peroxides. Suitable materials include cellulose tri-acetate, polyester film (Mylar of Melinex), and acid-free paper.

When using plastic sleeves special concern should be given to air humidity control as photographic emulsions may tend to stick or ferrotype to the slick surface of these materials. If humidity cannot be constantly maintained below 55-60% then paper storage containers should be used. Glassine or kraft paper envelopes should never be used to store photographs. The use of polyethylene in thin sheet stock should be avoided as numerous problems have been observed with it in regard to sticking to film during relatively short term natural aging. These problems may stem from the anti-blocking (anti-stacking) agents used commercially to treat polyethylene films.

Unmounted photographs in good condition may be placed in cellulose triacetate or polyester film envelopes with an acid-free barrier board (.010 or .020" thickness) cut to the size of the storage sleeve. Once sleeved, these prints will receive maximum support if stored horizontally in acid-free boxes. The clear plastic sleeves allow the photographs to be viewed without being removed and therefore protect the photographs from scratches, dirt, and fingerprints at all times. The acid-free board support neutralizes acids, provides the photographs with additional support, and allows the print to be identified without labeling directly on the image.

Weakened, unmounted photographs in poor condition may be carefully stored in three-sided folders whose construction is described in the attached hand-out. (Appendix II) These folders may be purchased prefabricated (Conservation Resources International, Inc., University Products) or constructed in house.

Care must be taken when storing cyannotype photographs as high alkalinity will fade these images. Acid-free neutral papers, rather than buffered papers, should be used for their storage.

Mounted Photographs (Carte-de-Visites, Cabinet cards, Stereoviews, etc.)

Mounted photographs may be stored in a similiar fashion to unmounted photographs. Photofile supplys polyester film envelopes sized specifically for mounted photographs such as carte-de-visites, cabinet cards, stereoviews, etc..

Prints on extremely brittle mounts must receive extra support in the form of acid-free board inserted behind the mount.

Sleeved mounted photographs may be stored vertically or horizontally in acid-free boxes.

Mounted photographs may be hinged into acid-free mats using accepted paper conservation techniques. Never use the photographic mount as the back mat. Triangular perma-life corners may also be used to attach mounted photographs to the back mat. Mounted photographs must be supported at all four corners. Perma-life corners may be attached to the back mat with wheat starch paste or double-sided tape.

Glass Plate Negatives (Gelatin or Collodion)

Glass plate negatives should be individually stored in acid-free paper envelopes with their emulsion side facing away from the envelope's seam. Hygroscopic adhesive along the seam may promote fading of the image.

Glass plate negatives should be stored vertically on edge. Storage of glass plates in a vertical position is preferrred because it prevents undue build up of weight on the bottom plates which inevitably occurs with stacking. Vertical storage also allows for better air circulation around the plates. The storage of each plate in its own envelope prevents excess rubbing and abrasion on the plate. In addition, it permits the plates to be labeled and removed individually for study. Negatives in envelopes may be stored in either acid-free boxes or metal drawers.

Cracked or broken glass plates require immediate attention. Deteriorated plates should be supported on their emulsion side with a clean, clear single-weight piece of glass of the same dimension. The supported plate should then be protected on both sides with a piece of four-ply ragboard cut to the same size as the glass plate negative. The sandwich may be sealed at all edges with polyester film tape. Subject matter and condition may be noted on the ragboard support. Deteriorated plates may then be stored safely to await conservation treatment.

Cellulose Nitrate Negatives

Cellulose nitrate from which nitrate-base film is made is chemically unstable. It is very flamable but not explosive. The most dangerous aspects of nitrate film are:
1. Ease of ignition, including spontaneous ignition.
2. High rate of combustion.
3. Toxicity of combustion products.

The ignition temperature of stable nitrate film is only 300°F compared with 600°F for paper and 800-1000°F for saftey films. Contact with a heated electric lightbulb can cause ignition of nitrate film. Unstable nitrate film may ignite spontaneously at temperatures as low as 120°F. Once it burns, nitrate film burns very rapidly.

Among nitrate based films there is a great variation of life expectancy owing to various factors including differences in the manufacture, purity, and stability of the cellulose nitrate. Good ventilation during storage, allowing escape of nitrogen dioxide fumes, will prolong the film's life. Generally very thin roll film will keep better than thicker sheet film as the gases can escape more readily. High humidity accelerates decomposition because nitrogen dioxide converts to corrosive nitric acid in the presence of moisture. High temperatures promote accelerated rates of decomposition and must also be avoided.

The satisfactory condition for storage of nitrate film is about 40-50%RH. Relative humidity below 25% may embrittle the gelatin emulsion and cause it to crack if roughly handled.

All nitrate film base must be seperated from other negative and archival materials. The following stages of nitrate film decomposition may aid in its identification.
1. Amber discoloration with fading of the picture image.
2. The emulsion becomes adhesive like--the film tends to stick together.
3. The film contains gaseous bubbles and emits a noxious odor.
4. The film is soft.
5. The film degenerates partially or totally into a brownish, acrid powder.

If positive identification of the film is in question a float test may be preformed. Snip off a ¼" corner from the film in question and place it in a small bottle of trichloroethylene, available from a chemical supplier. Shake the bottle to insure that the film clip is completely immersed. If the sample sinks it is nitrate-based film. If it floats it is safety base, cellulose acetate, or polyester film. (While trichloroethylene is not flamable, the vapors should not be breathed.)

Once separated from the rest of the collection, cellulose nitrate negatives should be placed in acid free envelopes. Only porous paper should be used to allow the gas to escape freely. Buffered paper envelopes are preferred because they will aid in neutralizing the nitric acids.

ALL NITRATE BASE NEGATIVES MUST BE SEPARATED FROM OTHER COLLECTIONS

The possibility of long term storage in frost free refrigerators has recently been studied. Cellulose nitrate negatives may be carefully placed in Kodak Storage Envelopes for Processed Film. This envelope is a paper--polyethylene--foil laminate pouch that can be sealed with heat or freezer tape. After the envelope is filled, it should be carefully rubbed toward the opening to push out residual air before sealing. Following labeling, these envelopes may be housed in a frost free refrigerator. (For additional information see "A Temporary Method to Stabilize Deteriorating Cellulose Nitrate Still Camera Negatives," Photographic Conservation Newsletter, Graphic Arts Research Center, Rochester Institute of Technology, Vol. 2, No. 3, September, 1980.)

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BULLETIN NO. 16. STORAGE AND CARE OF PHOTOGRAPHS

Photographic images are found in many museums, galleries, and archives in a bewildering variety of types and sizes. Most commonly they occur in the form of negatives or as positive prints on paper. The carriers for negatives are usually transparent glass plates or plastic film, but translucent paper was also used as a support material in the early days of photography, i.e. from the mid 1830s to the late 1860s. In the nineteenth as well as the twentieth century, glass plates and plastic film have also served as carriers for black-and-white positives known as lantern slides. Yet other nineteenth-century photographs, such as daguerreotypes or ambrotypes, can be either negative or positive, depending upon how they are viewed. While the majority of the older photographs made before the 1950s are black-and-white, most photographs taken during the last two decades are in color. Color prints today are commonly made on a resin-coated paper base (RC paper), but some have a plastic support made opaque through the inclusion of white pigments. Color negatives and color transparencies in various formats are found in increasingly greater numbers in collections. The purpose of this Bulletin is to summarize the properties of the most common varieties of photographic pictures and to recommend procedures and precautions for their storage, handling, and care, particularly in smaller collections and repositories where extensive in-house technical support may not be available.

The Nature of Photographic Records

Almost all photographs consist essentially of a two-layer structure, the support and an image-bearing layer. This structure, which distinguishes them from most other documents found in archives, libraries, and museums, largely determines their properties. Common support materials include glass, plastic film, and paper, and more recently, resin-coated paper (RC paper) and pigmented plastic sheets. Most of these materials are relatively stable when kept in suitable storage conditions.
Glass plate negatives are conveniently divided into those made by the wet collodion process and those made by silver gelatin emulsion processes. Wet collodion glass plate negatives, which were introduced in the early 1850s, commonly were varnished after processing, and this contributed significantly to the stability of the image. Gelatin dry plates, which began to replace wet collodion plates in the 1880s, have crisp black, gray, or clear tones. Plastic film supports may consist of cellulose nitrate or of so-called safety film. Safety film may be a cellulose acetate material

or polyester; both are considered suitable for permanent record keeping. Early negatives on cellulose diacetate film, however, have been observed to shrink, leaving a creased or shriveled image. Cellulose nitrate film also has some undesirable properties: it is inherently unstable and highly flammable. Cellulose nitrate negatives that appear to be in good condition today may start to disintegrate badly within a year. Cellulose nitrate film has also been reported to have self-ignited. Its manufacture was discontinued in 1951. Other support materials used in the nineteenth century, such as canvas, ivory, or leather, are rare, although tintypes, collodion negative images on black or brown ("japanned") iron, are fairly common. The behavior of the three most common binding agents--albumen, collodion, and gelatin--towards water and ethyl alcohol may serve to determine the nature of the photograph. While gelatin is impermeable to pure alcohol, a gelatin film or print will swell visibly under a drop of water; collodion is soluble in alcohol but not in water, and albumen reacts with neither.

The image-bearing layer of most black-and-white photographs consists of microscopically small particles of elemental silver in a binding medium. The latter may be collodion (for example in wet collodion glass plate negatives or in collodio-chloride prints), albumen, or, predominantly for the past one hundred years, gelatin. All black-and-white negatives on film are silver gelatin materials. It is characteristic of black-and-white photographs that the image silver undergoes chemical reactions in the presence of aggressive materials. Such changes, which manifest themselves in the form of discoloration (i.e. either fading or staining of the image), can be measured quantitatively, before changes in density* are apparent to the viewer. They are usually caused by aggressive chemicals, such as peroxides--which may be perceived as a reactive form of oxygen--and gaseous pollutants produced by industrial activity or automobile exhaust gases. Among these are hydrogen sulfide, nitrogen oxides, or sulfur dioxide. Reactions leading to discoloration are accelerated in the presence of high relative humidity.

Exceptions to the distinct layer structure are salted paper prints, or salt prints, which have no clearly defined binding medium. Because of the absence of a protective binding agent in salt prints, the silver particles, which constitute the image, lie partially on the paper surface and partially are absorbed into the paper fibers. These prints should be considered to be more susceptible to fading than other black-and-white photographs, because of the absence of a protective layer, and also because processing methods from the late 1830s to the 1860s were not always thorough. In contrast, platinotypes, or platinum prints, which are also made without a binding agent, are very stable, because platinum is a non-reactive metal.

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*Density expresses the degree of blackness in areas of a negative or print. Density measurements are performed easily and quickly with an instrument called a densitometer, and they are non-destructive to the photograph.

Color photographs differ from black-and-white photographs in that they contain organic dyes as the image-forming substance. While their light-sensitivity is caused by the presence of certain silver salts, specifically silver halides in the unprocessed film, the finished color picture (negative, slide, or print) no longer contains any silver. Thus the permanence characteristics of color photographs are distinctly different from those of black-and-white materials. Because of the instability of organic dyes, color photographs are strongly affected by exposure to light, and they are virtually the only fine art objects known to fade in the dark. The terms "dark storage" and "dark storage stability" were coined to describe properties of color photographs. According to industry standards, the permanence of color photographs is determined under exposure to light ("light fading") as well as in dark storage ("dark fading"), because different mechanisms are operating in the two situations.

Storage of Photographs: Humidity

All processed photographic materials are sensitive to high levels of relative humidity as well as to fluctuations in relative humidity. Alone, or in the presence of aggressive chemical reactants, relative humidity is the overriding factor determining the longevity of photographs. Fluctuating relative humidity will impose considerable strain on the adhesion of the gelatin to the support as it expands and contracts. Typically, both negatives on film and paper prints will curl up in a dry environment and then flatten out again if humidity rises. Recommendations with respect to environmental conditions for the storage of processed photographic materials have been published by the American National Standards Institute (ANSI). An acceptable relative humidity level for the storage of plates, prints, and films is between 20% and 50%. It should never exceed 60% in order to avoid the growth of microorganisms such as mold. Recent evidence suggests that a level of 30% to 35% is an optimum condition for all processed photographs.

Storage Temperature

Recommended temperature levels for the storage of photographs and negatives range from 15°C (59°F) to 25°C (77°F) for glass plates, below 21°C (77°F) for film, and between 15°C (59°F) and 25°C (77°F) for paper prints. The storage temperature must never exceed 32°C (90°F). Storage at low temperature levels, for example at 2°C (35°F), or even below the freezing point of water (0°C or 32°F), is not only not harmful to the stability of any processed photographic material, but will extend its longevity considerably. Cold storage--at about 30% relative humidity--is particularly advised for color photographs. Data published by researchers from the Eastman Kodak Company clearly indicate that the relative fading rate of a color photograph is slowed down by a factor of 1000 if the storage temperature is changed from 24°C (75°F) to -26°C (-15°F). Color photographs that will be kept at a low temperature must be sealed in heat-sealable envelopes. Made by the Eastman Kodak Company, these envelopes have a three-layer structure, consisting of polyethylene, aluminum foil, and kraft paper, which provides a complete moisture and gas barrier. In addition, the storage environment should be free of harmful chemicals, notably peroxides, hydrogen sulfide, and ozone.

Filing Enclosures for Photographs

Common photographic records--glass plates, sheet films, and prints--should be kept in suitable filing enclosures made either of paper or of chemically inert plastics. Specifications for the quality of such materials include uncoated polyethylene, cellulose triacetate, and polyester; the term uncoated is a key word here. Chlorinated or nitrated plastic sheeting, such as polyvinyl chloride (PVC), should not be used. Paper filing enclosures must have a high alpha-cellulose content (greater than 85%); they must be free of sulfur; and their pH value should be around the neutral point (i.e. pH 6.5 to 7.5). This latter specification differs from the ANSI standard PH1.53-1978, which recommends a pH for paper filing enclosures of 7.5 to 9.5. For best protection, a photographic negative or print inside a stable plastic sleeve (e.g., uncoated polyester) is then placed in a paper envelope with all necessary information written on it. Glass plate negatives are sleeved and stored vertically in a box equipped with grooves, or tightly packed in a manuscript box. Roll films can be left in rolls or cut, either into single frames or into strips of several images. For example, 35mm films can be cut conveniently into strips of six images and placed into uncoated polyester (Mylar-S) sleeves that measure 1 5/8" x 9 1/4". These particular sleeves have the advantages of being slightly larger (by 1/8" to 1/4") than the standard formats for photographs, which considerably facilitates handling. Daguerreotypes and other cased images may be stored in small document boxes or in hand-made phase boxes measured to fit each object. They should be left intact in their cases and handled only by experts. A careful selection of filing enclosures for the long-term storage of photographs is essential because they are in direct contact with the surface of the photograph. Volatile chemicals from newsprint, adhesives from seams of envelopes, and peroxides emanating from fresh, oil-based paint layers on walls are all known to have caused discoloration of photographs. They have contributed to the formation of a tarnish, which appears as a blue metallic sheen in dark areas of photographic negatives and prints based on silver, as opposed to photographs based on other metals or metal salts. This type of discoloration is popularly referred to as "sulfiding out" or "silvering out." It is caused by image silver that has migrated to the surface and re-deposited itself as a thin layer. This is rarely seen on wet collodion glass plate negatives due to the protective action of the varnish coating.

Display and Exposure to Light

Negatives are intended for use in printing positive pictures. Brief exposure of the negative to light--either in contact with the printing paper or in the enlarger--is not considered to cause any harmful effects. Prolonged exposure, however--especially to strong sunlight--poses the risk of embrittling the gelatin layer. Fortunately, photographic negatives and prints are normally stored in the dark in filing enclosures or boxes and are thus protected from prolonged exposure to light. There is no published evidence that light alone will cause discoloration or fading of black-and-white silver gelatin prints on developing-out paper, although it may cause degradation of cellulose. However, an interlayer present in most photographic prints between the paper support and the image-bearing layer which consists of barium sulfate in gelatin--called the baryta layer--protects cellulose fibers from being affected by light. Notable examples of photographic papers without baryta layer are albumen prints and certain portrait papers. Well-processed silver gelatin prints on fiber-base paper are essentially stable to light. They may be displayed for several weeks or a few months at light levels of approximately 10 footcandles (100 lux) without danger of deterioration. This is not true, however, for salted paper prints, albumen prints, and contemporary RC papers.

There is conclusive evidence that prolonged exposure to light will cause the dyes in a color photograph to change. Many factors have an influence on such changes, among them the nature of the dye present in a particular type of photograph, the intensity of the light source, its spectral distribution, and the length of exposure to light. For any color print, exposure to ultraviolet radiation--which is also present in fluorescent lamps--should be avoided. Exposure to direct sunlight must be prevented at all costs. Instead, tungsten light sources should be used for illuminating color prints on display. While a general agreement on permissible light levels does not exist, it is not safe to exceed 10 footcandles (100 lux) when displaying valuable color prints. Display time should be limited to a few weeks.

Originals of historically significant color pictures should not be displayed: copy prints should be made for display purposes. If this cannot be done, other methods should be used to limit exposure to light. For example, the photograph may be draped with a black felt cloth that the viewer can lift in order to see the picture. A valuable photograph might also be displayed in a dark exhibition case fitted with a hinged cover and wired so that a light above the case switches on automatically when a viewer opens the cover.

It is recommended that densities of black-and-white and color prints be monitored. This is done by taking measurements of the highlight, mid-tone, and dark areas of the photograph before it goes on display. A complete condition report that includes density readings before and after an exhibition is the only certain means to determine whether image changes have occurred.

Mounting of Prints

Care should be taken in preparing photographic prints for exhibition. Like other works of art on paper, valuable prints should be mounted on museum-quality board and protected with a window mat, which functions as a spacer. The mat prevents direct contact of the print surface with the cover glass, which could otherwise become adhered to the print. This is because gelatin swells and develops glue-like properties when it becomes wet. For details of techniques for mounting works of art on paper refer to the reading list for this Bulletin.

Many fine art photographers have dry-mounted their prints and some continue to do so. There is no evidence that dry-mounting of photographic prints causes degradation of the silver image. However, although it produces well-mounted, perfectly flat prints, dry-mounting has the disadvantage of being, practically speaking, irreversible, notwithstanding manufacturers' claims that dry-mounted prints can be dismounted by re-heating them in a press. This procedure is not safe for the print.

Handling and Care

Unsleeved negatives and prints--whether on glass, plastic film, paper or metal--should be handled only with lintless cotton or nylon gloves since the image-bearing layer--whether gelatin, collodion or albumen--is susceptible to mechanical damage from fingerprints or scratches. Photographs should not be folded or left unprotected from dust and direct sunlight. Large panoramic negatives or prints should not be stored rolled up; they can be stored flat in map cases. Food and beverages should never be consumed in the vicinity of photographs. Prints or negatives must not be stapled or attached to other documents with paper clips. All glass plate negatives have a fragile support, which demands that they be handled with particular care. Experience has shown that photographic paper supports, which have been machine-made since the 1860s, are of fine quality and among the most permanent of all papers, although they may be damaged by creasing, tearing or other forms of careless handling.

Making a contact print from a negative provides a simple means of evaluating the negative's quality and condition. If negatives are used heavily for printing, duplicate negatives should be made. With proper sensitometric control, they yield positive prints that are so nearly equivalent in sharpness and tonal range that to the naked eye they are not distinguishable from those made from the original negative. It is imperative to make faithful duplicate negatives for originals on cellulose nitrate film base before the onset of visible deterioration.

Since duplication of negatives requires special expertise, the work must be done by a professional photographer or laboratory. Similarly, original prints, particularly those most susceptible to fading, should be protected from frequent use and handling by re-photographing them. The resultant copy negative will produce a reference print for the use of clients.

Water Damage (Disaster Preparedness)

Like all organic materials, photographic negatives and prints can sustain grave damage if they are exposed to water. Most black-and-white and color photographic negatives and prints that have been immersed in water should be air-dried immediately. However, if this is impossible, they can also be frozen safely (for example in a regular home or commercial freezer) and kept in that state for some time, until they can be thawed and air-dried. Alternatively, frozen negatives and prints can be freeze-dried in a vacuum chamber. A cycle of freezing, thawing and vacuum-drying, as is done with books, is not recommended for photographs because blocking and sticking of gelatin layers will occur. Glass plate negatives made by the wet collodion process--as well as the collodion positives commonly called ambrotypes and tintypes--should not be frozen after they have been immersed in water, and they should never be freeze-dried. These photographs must be stored in a manner that will prevent their being flooded or soaked in water by using, for example, rigid polyethylene boxes with snap-on lids or watertight ammunition boxes, or by covering storage boxes with polyethylene sheeting. Because of their rarity and inherent value, daguerreotypes should probably be included in this precaution even though no experimental data exist to confirm the behavior of these images after soaking, freezing, and freeze-drying. Similarly, such experimental data do not exist for pre-1935 lantern slides made by additive color formation processes. (Examples are the Lumière Autochrome Plates, Finlay Color Plates, Dufay Color Plates, Duplex Color Plates, and several others.)

Klaus B. Hendriks
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Public Archives of Canada

Reading List

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1985

(Excerpted chapter from Preservation of Contemporary Photographic Materials)

Storing color materials

frost-free refrigerators offer a low-cost solution

In our August issue, we presented two articles concerning the stability of processed photographic materials. The initial article by David Kach examined the technical basis for the problem and recommended various procedures for insuring maximum image permanence. An accompanying feature by archivist Klaus B. Hendriks discussed the challenge of preserving and restoring historical photographic records. This related article offers photographers and collectors an inexpensive and practical means of humidity-controlled cold-storage aimed at assuring a long-term useful life for historically *and* personally valuable photographic records.

HENRY WILHELM

Use of a modern frost-free refrigerator/freezer is the only simple way to store color materials at low temperature and humidity levels without the use of vapor proof packaging. The refrigerator compartment of such a combination refrigerator/freezer can maintain a temperature of about 1.5°C (35°C), and relative humidity levels between 25 and 35 percent all year around, regardless of the ambient humidity and temperature levels. Relative humidity of 25 to 30 percent is currently suggested as the "ideal" level for photograph storage.

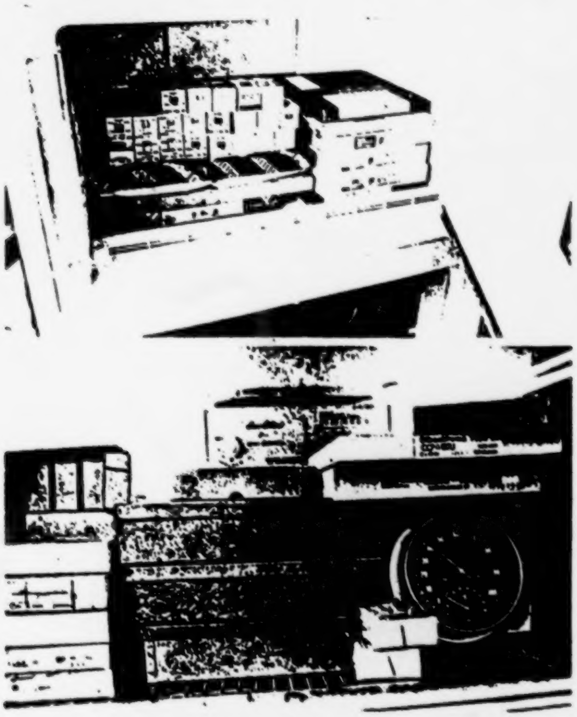
Materials stored in the refrigerator will be readily accessible, requiring only that they be placed in a polyethylene bag immediately upon being removed from the refrigerator to prevent moisture condensation.

Research for this project was, to the author's knowledge, the first investigation of the use of low cost, frost-free home refrigerators for storage of color photographs without the need for vapor protection. Because the author has not had the opportunity to examine nearly all the makes of frost-free refrigerators on the market, discussions will be limited to general observations on the various types of refrigerators presently being sold, and give specific data on a frost-free refrigerator sold by Sears Roebuck that is now being used to store the color photograph collection of East Street Gallery.

Many other brands will maintain adequate temperature and humidity levels. However, due caution should be exercised in selecting a refrigerator for photograph storage. Many advertised as "frost-free," notably the "cycle-defrost" types and those having "frost-free" refrigerator compartments but manual defrost freezer sections, will maintain very high levels of humidity and quickly ruin unprotected photographs. None of the older manual defrost refrigerators can be used for unprotected photograph storage, as they normally have humidity levels between 90 and 100 percent.

With the frost-free units recommended here, only the refrigerator compartment can be used for unprotected storage. The freezer compartment has high humidity levels, especially during the daily automatic defrost periods. By the same token, "frost-free" freezers, which have no refrigerator compartments, cannot be used for unprotected storage of photographs.

The operating principle of a low humidity, frost-free combination refrigerator/freezer is fairly simple: Air is cooled in the



(Top) Freezer compartment containing factory packed materials in vapor proof packaging. (Above) Refrigerator shelf (with hygrometer) arranged for air flow containing processed and unprocessed photographic materials.

Cautions When Using A Frost-Free Refrigerator For Photograph Storage

1) Be absolutely certain you have proper type of frost-free refrigerator/freezer combination unit. Test humidity level of unit under operating conditions prior to placing photographs in it for storage. Continue to check humidity for a period of several weeks.
2) Use only the refrigerator compartment (not freezer section) for unprotected storage of photographs.
3) Photographs should be placed inside cardboard boxes (transparencies may be kept in original slide boxes made of cardboard or plastic as supplied by processor) to protect photographs from humidity peaks which occur when refrigerator door is opened or after defrost cycle.
4) Photographs in their boxes should immediately be placed in a plastic bag upon removal from refrigerator to prevent moisture from condensing on them while they are warmed up to room temperature.
5) Avoid opening refrigerator door more often than necessary.
6) In event of power failure of up to 48 hours (2 days) duration do NOT open refrigerator door.
7) In event of power failure of longer than 48 hours it is best to open refrigerator door and leave open until power is restored.

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475 Park Avenue South, New York, N.Y. 10016).

freezer section by coils which are about −29°C (about −20°F). Most of the moisture in the air is condensed on the coils in the form of ice crystals at this very low temperature. The air, forced by a fan, is then circulated throughout the freezer compartment and warms up to about −18°C (0°F). From there it goes into the refrigerator compartment where it warms up to 1.5°C (35°F). Because the air warms up from the original low temperature of the cooling coils, the relative humidity drops to between 25 and 35 percent. This "temperature rise-humidity drop" effect takes place only in refrigerators which have the design features listed in the accompanying box.

A type of refrigerator often confused with the true "frost-free" design is that known as the "cycle-defrost" refrigerator. These are generally advertised as having frost-free refrigerator sections, but manual defrost freezer sections. These work by having separate cooling coils attached to a thin aluminum plate in the refrigerator section.

When the unit operates, the coils and plate form a small amount of frost. Between running cycles, the plate rapidly warms up to the temperature of the refrigerator compartment, which is above freezing, and the melted frost is drained off. These units use much less electricity than a true frost-free unit and are often advertised as being "energy saving." They ARE NOT suitable for unprotected photograph storage because they have a very high level of humidity. An older design based on a similar principle had cooling coils located behind the walls of the refrigerator section that were so arranged that they never reached a temperature below freezing. The interior walls of such a refrigerator are usually wet with condensed moisture and the humidity level is normally near 100 percent.

Most color materials will suffer serious fading and shifts in color balance over a period of years if stored in the dark at normal room temperatures and humidities—even if the areas are air conditioned during the warm and humid summer months. In their publication E-36 on Vericolor II negative color film, Kodak states: "Storage at a temperature of 21°C (70°F) with a relative humidity (RH) not exceeding 40 percent is considered satisfactory for properly processed Vericolor II negatives that are intended to produce satisfactory prints for a period of two to five years. Negatives that are stored in a refrigerator at 1.5°C (35°F) should be expected to retain satisfactory reprinting characteristics for at least ten times longer than those stored at room temperature (21°C). Storage of negatives in a freezer at −18 to −23°C (0 to −10°F) should provide maximum stability of the dye images, enabling properly processed negatives to print satisfactorily for very long, indefinite periods of time. When stored at these low temperatures, the negatives must be protected to maintain the proper moisture content."

Typical Kodak incorporated coupler transparency films, such as Ektachrome Process E-4 or Process E-6, which might be expected to show a noticeable fading (about ten percent) or color shift in about ten to 20 years time in uncontrolled room storage, may be expected to last 100 years or more in a frost-free refrigerator before the same amount of deterioration is evident. Kodachrome films or Cibachrome prints might last as long as 800 years in refrigerated storage.

Henry Wilhelm is a researcher and head of East Street Gallery, a manufacturer of archival processing equipment. This article is excepted from his forthcoming book. Preservation of Contemporary Photography Materials, *to be published in December by East Street Gallery, Grinnel IA 50112. © Copyright 1978 by Henry Wilhelm.*

APPROXIMATE WARM UP TIMES FOR VARIOUS TYPES OF PACKAGES

	Warm Up Times To Room Temperature [20°C - 68°F]	
Type of Package	From 0°C to 20°C (From 32°F to 68°F) 20°C Temp. Rise (36°F Temp. Rise)	From −20°C to 20°C (From −4°F to 68°F) 40°C Temp. Rise (72°F Temp. Rise)
36 exp. box of slides in Kodak paper box	40 min	1 hour
Envelope with 6 strips of 6 exp. 35mm film in polyester or acetate sleeves inside	10 min	15 min
35mm reel of film in metal film can	3 hours	4 hours
16mm reel of film metal film can	1½ hours	2 hours
10 paper prints in flat cardboard box	1 hour	1½ hours
100 paper prints in flat cardboard box	3 hours	4 hours

Above approximate warm up times are for single containers of the types mentioned wrapped in a single layer polyethylene bag to prevent moisture condensation and placed on a table so air can circulate freely around the container. Do not stack containers together during the warm up period unless greatly increased warm up times are used.

For the photographers, this means that the use of the refrigerator for storage will prevent serious deterioration of color photographs during his or her lifetime, provided the films are not mishandled or projected in a slide projector when they are out of the refrigerator. For both the photographer and the collecting institution, this will ensure that valuable color materials can be preserved until such time as "permanent" color materials or processes are available, and the older unstable photographs can be copied onto this new medium.

Prints made on Ektacolor 74 RC Paper and Ektachrome RC Paper, Type 1993, which may be expected to show significant deterioration under typical conditions of dark storage in less than ten years, may be preserved for at least 100 years if kept in the refrigerator except for occasional viewing or short term display.

Protected storage

Old style refrigerators, which have to be manually defrosted from time to time, do of course maintain a low temperature, but the humidity level of this type of unit will generally be between 90 and 100 percent. At this relative humidity, films will stick together, fungus will grow on the film emulsions and cardboard slide mounts, and there will be moisture-caused deterioration (hydrolysis) of the color dyes.

Photographs stored unprotected in a standard refrigerator will be destroyed in a short period of time.

If it is necessary to store photographs in a standard refrigerator, they must be preconditioned to a low humidity and then sealed in a true vapor proof container, such as a properly capped glass bottle or a metal foil/plastic laminated pouch that can be heat sealed. Virtually all types of plastics will absorb and transmit moisture over a period of time and are thus NOT SUITABLE for moisture protection of photographs in cold storage.

Kodak recently made available a foil/polyethylene/paper laminated pouch that may be heat sealed with a commercial heat sealing unit or an electric (dry) household iron at a temperature between 120-150°C (250-300°F), which is usually near the "cotton" setting of the iron. These pouches are similar to those used to factory pack sheet films, and are available in 4x5 and 8x10-inch sizes. They are called Kodak Storage Envelopes for Processed Film, and may be ordered through Kodak dealers.

The author strongly recommends against the use of any high-humidity cold storage unit for storing valuable photographs, even if the photographs are in hermetically sealed containers. There is the constant risk of the containers failing, and in the case of pouches, they may be punctured in handling, causing pinholes which are not readily visible. Metal motion picture cans may be taped shut; however, the adhesive tapes generally used for this purpose give poor protection against vapor transmission. With film cans, there is the risk that a particular can may not be properly taped, or that the can will rust during long term storage. Any system which requires vapor proof containers will reduce accessibility to the photographs, increase costs, and probably require trained personnel to properly pre-condition and seal the film containers. There will always be the possibility of a container failing because of manufacturing fault, improper sealing or damage in handling, thus destroying photographs which can never be replaced.

A final objection to uncontrolled humidity, refrigerated storage is that the photograph containers will actually become wet with condensed moisture or covered with ice if the temperature is below freezing. This creates a very messy situation and makes identification of the containers difficult. At above freezing conditions, mold and slime may form on the containers.

Available equipment

Commercial equipment is available for maintaining low humidity conditions at low temperatures for virtually any size storage facility. Frost-free refrigerators have sufficient capacity for home and small commercial and museum use.

East Street Gallery has been using a Kenmore Frostless refrigerator/freezer for storage of color materials. This unit is Model No. 69511, sold by Sears Roebuck & Company. In the 1978 Sears Fall/Winter catalog, the unit sells for $369.96. It is equipped with a "Power Miser" control that may be used to shut off external electric wall heaters during times of the year when the relative humidity is low. The heaters prevent moisture from condensing on the slightly cooled exterior surface of the refrigerator during periods of high air relative humidity. The heaters are not necessary during the winter months when the relative humidity indoors is low in most areas of the country.

This model has a 10.8 cubic foot refrigerator section capacity which we calculate will contain about 20,000 transparencies mounted in standard 35mm cardboard mounts, a figure based on the transparencies being packed in standard Kodak 36 exposure cardboard slide boxes with a reasonable amount of care in orderly packing. The 20,000 transparency capacity leaves sufficient air space between the groups of boxes so that the air may circulate freely throughout the refrigerator compartment.

The Model 69511 has two controls located inside the refrigerator compartment. For storing color photographs, the Cold Control should be set on the No. 5 position (Coldest), and the Usage Control should be set on position C (Heavier Refrigerator Usage). These control settings will allow the maximum amount of cold dehumidified air to enter the refrigerator compartment, and will typically produce temperatures of −4 to −1°C (25-30°F) at about 30 percent relative humidity. A third control, marked Power Miser, was discussed earlier, and has no influence on conditions inside the refrigerator.

This Kenmore refrigerator/freezer has the cooling coils located behind a metal wall in the upper freezer compartment. A fan located in front of the cooling coils circulates cold air from the coils into the refrigerator and freezer compartments, and runs only when the unit's compressor is running, at which time the cooling coils are about −29°C (−20°F). Moisture in the air is condensed on the coils in the form of ice crystals as it passes over them. When the compressor is not running, the temperature of the cooling coils rises to about that of the freezer compartment (−18°C or 0°F) and some of the ice on the coils evaporates directly to water vapor, gradually raising the relative humidity in the freezer compartment to about 90 percent. As the moist but very cold air from the freezer compartment enters the refrigerator compartment, it warms up to about 1.5°C (35°F). In doing so, the capacity of the air to contain moisture greatly increases, thereby dropping the relative humidity of the air to about 25 or 30 percent. This is, however, a very low humidity for food storage and is one of the "problems" of a frost-free refrigerator, according to the manufacturers. At this low level of humidity, food will rapidly dry out unless properly wrapped.

As the cooling coils condense moisture out of the air, they become covered with ice, which must be removed from time to time, or the coils will become clogged and the fan-forced air will not pass through the coils. To accomplish removal of the ice, frost-free refrigerators have "defrost cycle," during which time the compressor is shut off and an electric heater located

Design Features

1) Unit must have separate refrigerator and freezer compartments. Compartments have separate doors and may be side-by-side or one on top of the other.
2) Cooling coils are located ONLY in freezer compartment.
3) Cooling coils are located in isolated compartment in freezer section and cannot be seen without disassembling the unit. No part of the freezer or refrigerator which forms ice crystals can be seen.
4) Air is forced over the coils and into the freezer compartment by a fan. The fan will make noise when running and a blast of air will be noted coming out of one or more ducts in the freezer and refrigerator sections.
5) This is the most important design feature: ALL cooling in the refrigerator section comes from cold air blown in from the freezer section by a fan.

under the coils melts the ice. The water formed during this process is collected in a trough and runs through a pipe to an "evaporator" pan located near the compressor in the bottom of the unit.

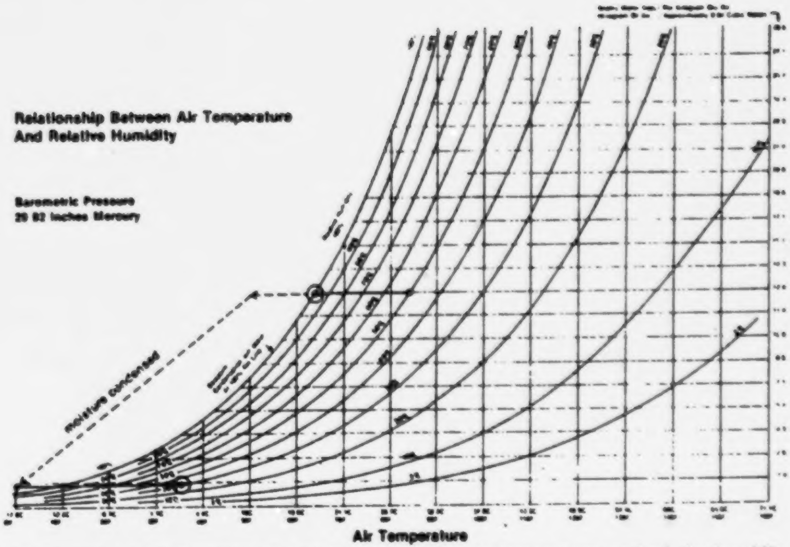
Films and prints should NOT be stored in the freezer compartment of a frost-free unit unless they are sealed in vapor proof containers and these placed in an insulating box (several thicknesses of cardboard, etc.) During the defrost cycle, the interior temperature of the freezer compartment will rapidly rise from about −18°C (0°F) up to 21°C (70°F) or above. The humidity level also reaches near 100 percent during this period. The freezer section may be useful for storage of factory packed unexposed film and paper, which should be placed in an insulating box within the freezer section to prevent the abrupt temperature changes from affecting the film and paper.

The temperature and humidity levels in the refrigerator compartment stay fairly constant during the defrost period, though there will be a humidity rise for about 15 minutes after the cooling cycle and blower start. This short humidity rise will not affect stored materials if they are in almost any sort of box or bag. The author's tests show that this humidity peak in the refrigerator section is of such short duration that even a single thickness of paper wrapped around a box of slides will prevent more than a couple of percentage points of humidity rise. The slide box itself offers adequate protection for the slides during this short humidity peak, so no additional packing is needed. The temperature of the refrigerator compartment stays nearly constant during and after the defrost cycle, provided the door isn't opened during the cycle.

Cautions

Frost-free refrigerators use a great deal more electrical energy than do standard refrigerators—on the average three or four times as much. Most of the refrigerators on the market today, both frost-free and conventional types, are poorly insulated. The current fashion of "thin-wall" refrigerators, even with low loss plastic foam insulation, results in excessive heat transfer, which increases operating costs. The high heat transfer also requires that electrical "anti-condensation" heaters (resistance heater wires located next to the outside walls of the refrigerator) be operated with much higher current levels than would be necessary if more insulation were used. The Sears Roebuck refrigerator/freezer, which is recommended here, is no exception to the typical poorly insulated design of modern refrigerators.

The author does NOT recommend that color materials be stored in a refrigerator that also contains food items, as the food will give off a wide variety of chemicals and water vapor. There is also the very real danger of getting food, oils, etc., physically on the photographs or storage boxes. Small amounts of color films may be stored in a refrigerator containing food by sealing the films in a glass bottle or Kodak foil storage pouches.



Psychometric chart illustrates the relationship between air temperature and relative humidity (RH) based upon the air's capacity to retain water vapor. Lower heavy line demonstrates how the RH of air at 0°F drops from 100 to 30% when blown into an area with 35°F temperature levels.

While many frost-free refrigerator/freezers should be suitable for photograph storage, the author feels the previously described Sears unit is a good choice as it is available throughout the U.S. It is also one of the lowest cost units of this type on the market.

Testing necessary

The operating characteristics of ANY unit must be known before any valuable photographs are stored in it. THIS PRIOR TESTING IS ABSOLUTELY NECESSARY. It is especially important that a unit be tested for humidity level from time to time during the summer months to be certain excessive humidity levels don't develop. For instance, a standard manual defrost refrigerator with no food in it may, for a time, test an acceptable level of humidity during the winter months because of the very low indoor humidity in most buildings when the outdoor temperature is low. But this type of unit will rapidly rise to humidity levels near 100 percent when spring arrives, thus destroying any photographs stored within.

Until a unit has been used for some weeks in the summer, a hygrometer should be stored inside the refrigerator compartment so it may be checked each time the door is opened, keeping in mind that there will be a short time of high humidity after each defrost cycle. When purchasing a unit, make certain it is a true frost-free model, with *both* the refrigerator and freezer compartments guaranteed frost-free. Then check it with a hygrometer to make certain it is satisfactory.

Refrigerators and freezers should be located in a well ventilated location—never in a closet or other small enclosed room. As mentioned earlier, a refrigerator—especially a frost-free model—gives off considerable heat because of the defrosting heater and the anti-condensation heating wires built into the refrigerator wall.

Low-humidity refrigerated storage is also a necessity in tropical or other areas that normally have relative humidities of higher than 60 percent not only to protect the photographs from excessive heat, but also from the high humidity which will in time cause fungus growths to destroy the films. In such areas, black and white negatives and prints must also be stored in low humidity conditions.

The cost of the refrigerator will be small when compared to the value of the film and processing costs of the photographs stored in it. The cost of 50 or 60 rolls of processed 35mm color film may equal that of the refrigerator. Photographs of personal, artistic or historical importance must be considered priceless, as once they are damaged or destroyed, they generally can never be replaced. A commercial photographer should consider the sales possibilities of reprints in future years from photographs that have been properly stored. There will also be considerable time saved in making reprints from even fairly recent photographs, as the filter packs and exposure times will not have changed significantly from those of the original prints. □

Moving Images

from HISTORY NEWS, December 1980, p.39

CONSERVA· TIPS

Care of Video Tapes

BY STEPHEN C. CHAMBERLAIN

Historical organizations should avoid using video tapes for records that need to be permanently kept. Unlike film, tapes are a product of magnetic technology and the "image" cannot be fixed. As a result, video tapes can be affected by any close, stray magnetic field. Because playback is accomplished with a decoding head on which the tape runs directly, the number of times one can play any given tape is limited. Each time a tape is played, some of the emulsion is scraped off, along with its attendant image. After repeated use, the image will become noticeably degraded.

In addition, there are no statistics on the long term stability of the binder, or glue, that holds the magnetic particles on the plastic base. Early tapes deposited at the Library of Congress show signs that the emulsion is separating from the base. Technology is far superior today, but the fact remains that commercial and consumer markets have not demanded a stable tape. Consequently, until we know otherwise, we must assume that modern video tapes do not meet minimum archival standards even under the best of conditions. If, however, you already have invested in video equipment and tapes, the following procedures will help care for them:

- Follow precisely the cleaning instructions for your machines. Pay particular attention to the tape heads for both cleaning and demagnetizing.
- Keep at least one copy of valuable tapes in reserve, unused. Keep another first-generation copy unused except as your master reference copy. At the Museum of Broadcasting, user copies—half-inch Betamax casettes—are made from three-quarter inch master copies. The three-quarter-inch copy is used only once or twice a year to make additional half-inch copies.
- Do not rewind the tapes after users are finished with them. Return them to storage unwound, and rewind them only when ready to view them again. Rewinding, fast forward and fast reverse, causes the tape to stretch slightly. When this tightly stretched tape is stored for long periods of time—and sometimes not so long—the magnetic information on one piece of tape will transfer magnetically to the layer over or under it resulting in "print-through." Remember, the "image" and the sound are not fixed.
- Do not allow users to run through tape at will on the machine. Footage inventory on each tape should guide them to the required area. Uncontrolled use subjects the tapes to great strains. To increase longevity, control use.

Few published figures are available on temperatures and humidity controls in video tape storage areas, but an average relative humidity between 40 and 50 percent would be acceptable, with a temperature between the mid-sixties and the low seventies. **HN**

A doctoral candidate in film at Columbia University, Stephen Chamberlain works for DuArt Film Laboratories, Inc., in New York City. This Conserva-Tip is adapted from his letter written in response to the article "Available and Affordable: Video for the Historical Society" by Brad Jolley published in the March 1980 issue of HISTORY NEWS.

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handbook of
motion picture
film care

researched and prepared by
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and Susan Ellsworth

[illegible] Corporation, Lake Bluff, Illinois

1973

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introduction

The purpose of this handbook is to provide comprehensive information on handling, maintenance, and storage of processed motion picture films. The procedures and recommendations presented were gathered from many sources with the objective of assisting film librarians in establishing an efficient preventive maintenance program.

The primary factor in effective use of film and other software resources is, quite simply, care. Care in handling, preventive maintenance, and proper storage results in added uses of motion picture films. This is important not only to cost-effective operations, but also to providing quality resources to fulfill the information or entertainment needs of library users.

In this handbook I have attempted to gather and organize all the information needed by a film librarian to initiate a preventive maintenance program. I realize, though, that you may have some questions about film care that are not answered within this handbook. If you do, please feel free to contact me at the following address:

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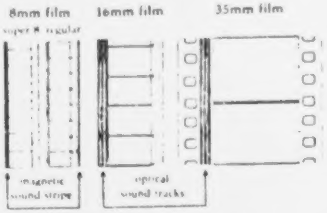
1. a few words on film

A thin sheet of flexible cellulose or polyester is used for the *film base* or support. The *base* is coated with a light-sensitive *emulsion* in which the photographic image is formed.

Motion picture film is commonly available in three sizes: 8mm*, 16mm, and 35mm. The measurement, in millimeters, describes the width of the film, not the size of the frame. Sound is recorded on an optical sound track or a magnetic sound stripe.



Both the *emulsion* and the *base* of the film are subject to damage from improper handling or storage. On pages 2 through 9, you will find a chart that outlines different types of film damage and the causes.

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*note: Super 8mm and 8mm film are the same width. Super 8mm film, though, has a larger frame area and is perforated differently than regular 8mm film. Not all projectors are designed to accept both types; check the manufacturer's instructions in regard to compatibility.

film damage chart

type of damage	cause of damage	corrective measures	preventive measures*
Scratches¹ (appear as vertical lines during projection; also called "rain")	Dust, dirt, contaminants on film		Regular program of film cleaning and projector maintenance
	Dust, dirt contaminants on projector gate or pulleys		Keep projectors covered Regular program of film cleaning and projector maintenance
	Dust, dirt contaminants on film reel		Inspect reels and cans for dirt, film chips, etc. regularly Store film properly
	Dust, dirt contaminants in film cartridge		Store films properly Clean or vacuum film cartridges regularly
	Improperly cleaned or inspected film		Change area of film cleaning cloth frequently Use film cleaning equipment
	Cinching (tightening end of film causing film to bind tightly against itself		Do not pull on the end of a wound reel of film Follow manufacturer's instructions when using automated film inspection equipment or rewinds

film damage chart (con't)

type of damage	cause of damage	corrective measures	preventive measures*
Sprocket mark on film or sound track	Improper threading of projector or film reversed on reel	Cut out damaged area	Follow projector manufacturer's instructions carefully
	Projector malfunction	Cut out damaged area Inspect and repair projector	Inspect projectors frequently Provide general maintenance and periodic servicing according to projector manufacturer's recommendations
Creases	Improper handling, mailing or storage	Cut out damaged area	Use film shipping containers Store films properly Handle films carefully
Burn spots	Incorrect bulb in projector	Cut out damaged area	Use projection lamps (bulbs) recommended by projector manufacturer
	Inappropriate use of single frame, stop motion or slow motion mode on projector	Cut out damaged area	Use single frame, stop motion, or slow motion only when projector has special features to prevent film damage Follow projector manufacturer's instructions
Curl	Improper storage	Clean film	Some curl can be expected in films without causing difficulties during projection Control temperature and humidity in storage

film damage chart (con't)

type of damage	cause of damage	corrective measures	preventive measures*
Smudges (appear as dark spots on film during projection)	Fingerprints and oil from fingers and hands	Clean flim	Wear film gloves when handling film Avoid touching film with bare hands
	Dirt	Clean film	Regular program of film cleaning and projector maintenance
	Excess oil or lubricant on projector or other film handling equipment	Clean film	When lubricating projectors, avoid getting excess oil on projector pulleys, rollers, and film gate Inspect all film handling equipment regularly
Mold, mildew	Improper storage	Clean film	Store films properly Control temperature and humidity Check stored films regularly
Breaks	Weak or improper splices	Repair splice	Make splices carefully Keep film cement tightly capped at all times
	Film is brittle due to improper storage	Splice and clean film	Store films properly Control temperature and humidity Check stored films regularly Regular program of film cleaning

film damage chart (con't)

type of damage	cause of damage	corrective measures	preventive measures*
Breaks (con't)	Improper threading or rewinding on projector	Splice film	Follow projector manufacturer's instructions carefully
	Film catches and tears on bent or damaged reel or cartridge	Discard bent or damaged reels	
Sprocket hole damage (will cause film to jump and chatter during projection)	Improper splices	Repair sprocket holes and splices	Make splices carefully
	Improper threading of projector	Repair sprocket holes	Follow projector manufacturer's instructions carefully
	Film shrinkage due to improper storage	Repair sprocket holes	Store films properly Control temperature and humidity Regular program of film cleaning
	Projection malfunction	Cut out damaged area Inspect and repair projector	Inspect projectors frequently Provide general maintenance and periodic servicing according to projector manufacturer's recommendations

note: Corrective measures for damaged films do not restore its original physical or visual properties. Preventive measures are considered to be more efficient.

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[*] Details on preventive measures listed on the chart can be found on pages 11 through 14.

[†] Once scratches appear on a film, it is necessary to clean the film and projector to prevent further damage. During projection, dust and dirt can be transferred back and forth from film to projector.

2 film maintenance

benefits of preventive maintenance

Cleaning, inspection, and maintenance of films and equipment means investing time and materials in a regular program. The result, though, of making this investment is the prevention of minor to severe damage to software and hardware. Damage to software is, unfortunately, often irreversible.

Cleaning and lubricating film will prolong both the quality of the visual image and the life of the film. Professionals in the field estimate that regular cleaning increases a film's life by 20 to 50%. A well maintained film may retain acceptable quality for 200 to 600 showings; a neglected film can have markedly decreased quality after only one showing.

Visual quality is as important as the dollars and cents factor of added showings. Scratches, *chattering*, and other problems in projected films may distract the viewer from the film's purpose or message. The viewer may also be amused, embarrassed, or receive a negative image of the organization responsible for presenting the film.

A consistent, thorough maintenance program is important to any film library, regardless of size. The time and expenditure are worthwhile investments; it usually takes less time to prevent a problem than it does to solve it.

preventive measures

1. Clean and lubricate library films regularly. Circulated films should be cleaned after every use.
2. Review the quality of films during projection or inspect after use by other persons.
3. Store films properly. Review or check films that have been stored or unused for 1 to 3 years. Look for dust and dirt, mold, mildew, and signs of brittleness such as splices beginning to open at the corners.
4. Handle films carefully. Avoid the following:
    - a. touching film surface with fingers
    - b. letting loose film fall on tables, floors, etc.
    - c. placing anything on top of films
    - d. stepping on films
5. Wear film gloves whenever handling films.
6. Make splices and other repairs carefully.
7. Discard bent or damaged reels or cartridges.
8. When mailing films, use standard plastic or fiber shipping cases. These have been specially designed to protect films from most damage.
9. Do not pull the end of a wound reel of film to tighten it.

10. Do not overfill reels; allow ¼ to ½ inch space to the rim.

11. It is recommended that smoking, drinking, or eating not be permitted in areas where film is handled or stored.

12. Use a film *leader* (2 to 3 feet is recommended) to protect the *head* of the film from damage caused by improper threading. A 2 to 3 foot *trailer* is also used to identify the *tail* end of the film. Green is most often used for the *head* and red for the *tail*.

13. Provide general maintenance and servicing for projectors according to the manufacturer's recommendations.

14. Keep projectors covered when not in use.

15. Project films with care.

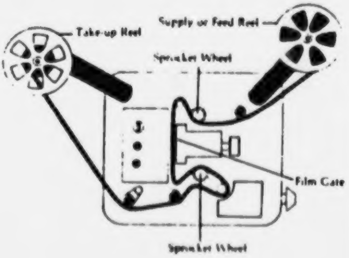
    a. Follow projector manufacturer's instructions for threading, operating, and rewinding.

    b. Clean the film path on the projector before each film use or, at least, daily. A cotton swab or small brush can be used.

    c. Use a *take-up reel* that is as large as the film's reel and be sure both are securely situated or latched on the reel spindles.

    d. Before starting the projector, check that the film is threaded correctly and the sprocket teeth and film sprocket holes are properly engaged.

    e. Stay nearby when operating a projector. If the film begins to jump and *chatter* or other problems develop, stop the projector first; then try to find the source of the problem.



A generalized view of a 16mm motion picture projector, illustrating the film path. The projector parts, particularly the film gate, should be cleaned regularly.

    f. If a film breaks, stop the projector immediately. Overlap the free end onto the *take-up reel*, rotate the reel to secure the end, and mark the break with a slip of paper. Never use adhesive tape, staples, paper clips, or other objects to temporarily mend broken film — such materials may permanently damage that part of the film.

    g. When using film *cartridges*, wait until the film has stopped before removing the *cartridge*.

h. Always report any problems with films or projectors to the person responsible for them; this helps prevent further damage to the materials and inconvenience to other users.
If you can't directly report the difficulties, write them down and include the note with the film or tape it to the projector.

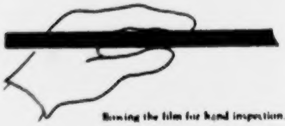
3. previewing and inspecting films

previewing

When projecting film, observe the quality of the image and sound. If there is a noticeable problem that doesn't require stopping the film, jot down the approximate time into the film or a description of what is on the screen. This can be used as a guideline for evaluation during inspection.

inspecting

Film inspection can be accomplished with the use of automatic machines or by hand while rewinding the film on your bench. When hand inspecting wear clean film gloves and use the thumb and index finger to apply pressure to the outside edges of the film. Use just enough pressure to slightly bow the film. If there are any tears, weak splices, or sprocket hole damage, the film will catch on the glove. While rewinding watch for scratches.



Bowing the film for hand inspection."

This procedure can be accomplished using a pair of rewinds. It is most convenient to inspect the suspended area of film and then clean it in one step, but the two procedures can be performed separately.

An *editor viewer* is helpful for locating scratches, but not essential.

When using automatic film inspection equipment, check the manufacturer's operating instructions carefully and make sure all personnel understand these instructions.

4. cleaning films

methods

The standards for a preventive maintenance cleaning program should be high.

The following guidelines are to insure safety for film and personnel:

1. Select a clean, well-lit, properly ventilated environment for cleaning films.

2. Use a high-quality film cleaning solution, observing cautions and directions that come with the product.

3. Be sure the *take-up reel* and can for the cleaned film are also clean.

4. Wear clean film gloves.

5. When using film cleaning equipment, follow the manufacturer's instructions carefully. Make sure personnel understand the threading path and operation of equipment

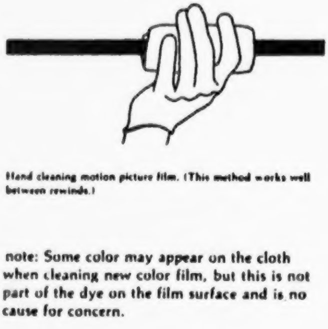
6. When cleaning films by hand, use a clean lintless pad, cloth, or velvet.

   a. Fold the cloth around both sides of the film at a point close to the *supply reel*. The film should be dry before it's wound onto the *take-up reel*, some cleaners can damage plastic reels or the *emulsion* of the film.

   b. Frequently change the area of contact between the film and the cloth, dirt build up on the cloth will scratch the film's surface. Refold the cloth frequently and replace the cloth when necessary.

   c. Dampen the cloth with film cleaner frequently as the solvent in the cleaner evaporates quickly.

   d. Streaks on the film can be buffed away with a soft lintless cloth, pad, or velvet.



Hand cleaning motion picture film. (This method works well between rewinds.)

note: Some color may appear on the cloth when cleaning new color film, but this is not part of the dye on the film surface and is no cause for concern.

cleaning super 8mm cartridge film

Some film cleaners may not be suitable for use on magnetic striped film. Consult the manufacturer's instructions before use on sound striped film.

Since there are many types of 8mm and Super 8mm *cartridges*, different care and methods of cleaning will be required. Check with the manufacturer for the best technique to use for cleaning specific *cartridges*.

film cleaning equipment

Film cleaning equipment simplifies and speeds up the cleaning process. With adequate equipment there is also less chance of damaging the film because of improper cleaning techniques. Film cleaning equipment is an important element in a time and cost-effective maintenance program for circulating libraries.

The equipment currently available ranges from inexpensive portable units to laboratory-type models. Prices range from under $1000 to over $10,000. It is advisable to investigate all the available equipment and select the model that best suits the needs of your library or organization. For more information on film cleaning equipment, consult the N.A.V.A. Audio Visual Equipment Directory (see resources for mailing address and other information) or you local audio visual dealer.

record keeping

Accurate records should be kept of film cleaning and inspection. Films should be marked (on the *leader* and/or can) when they have been cleaned, inspected and are ready for use. Detailed records of the dates and results of inspection are especially important to circulating libraries. With circulation records of users and equipment, inspection records can sometimes be helpful in identifying the source of a problem (for example, a user who continually abuses films, a projector that frequently tears or damages films, etc.).

5 circulating libraries

Circulating libraries have special problems with motion picture films because there is no way of knowing how the film will be handled by users. Some of these problems can be solved with the procedures listed below:

1. Clean films after every use and inspect for tears, burns, etc. Also check reels, cans, and *cartridges*.
2. Always check to be sure the correct film has been returned.
3. Label films and reels or *cartridges* with the catalog number, the title of the film, and the name of your library. Cans and storage containers should be labeled with full bibliographic information on the film and the name, address, and phone number of your library.
4. Keep accurate records of film circulation, inspections, maintenance, and repairs (of both films and projection equipment).
5. Insure all films that are mailed.
6. Enclose a notice with films requesting users to report problems and not to attempt any kind of repairs. Also request that they clean the film path of the projector before use with a small brush, cotton swab, or lintless cloth.

Explain that dust particles and dirt can scratch and permanently damage the film. Including cotton swabs, may enlist the aid of some users who don,t have a brush, swab, or cloth readily available.

7. Put a list of operating instructions and a schematic on or near projectors in a readily visible place.

8. Initiate a program or prepare a brochure that will encourage users to report problems with films and equipment. Point out that this assists you in providing effective maintenance and, therefore, better service to library users.

9. Set up a system of fines for film damage, repair, and replacement costs.

10. Have workshops on motion picture projection.

11. If you have a continuing problem, consult your film distributor or audiovisual dealer. They may have the solution or be able to direct you to someone who does.

6 film storage

1. Films should be stored vertically with head out, the end secured on a reel or *cartridge*, and in a film can or box.

2. Films with optical sound tracks can be stored in metal, plastic, or cardboard containers. Films with magnetic sound stripes are best stored in plastic or cardboard.

3. Storage areas should have a thermometer and a relative humidity indicator. If it is not possible to control the environment, a thorough maintenance program will reduce the possiblity of damage.

4. A constant temperature of 40 to 70°F (not above 80°F) and a relative humidity of 25 to 50% is recommended.

5. Avoid storing films near any of the following:

   a. heating pipes, heaters, other sources of heat
   b. sunlight (even when room is cool)
   c. sources of moisture, air conditioners
   d. chemicals (certain gases will bleach film)
   e. sources of dirt or dust
   f. magnetized objects, magnetic forces, excessive vibration, large electrical cables (these elements can have adverse effect on magnetically striped film)

6. When taking film out of storage:

   a. Wipe off the container before opening so that accumulated dust won't fall on the film.

b. If stored below room temperature, allow the film time to reach room temperature before projection.

7c film repair

sprocket damage

Damage to sprocket holes can be repaired with perforated mylar tape applied onto the film. Care must be exercised that the tape is aligned accurately with existing sprocket holes.

Replacement footage for areas with severly damaged sprockets can be purchased from the film's distributor and spliced into the film.

note: Be sure to wear clean film gloves when repairing film.

splicing

The simplest method for splicing is to use special purpose mylar tape and any one of the splicers available for it. The equipment, most of which is priced under $40 aligns the film and the splice is completed within a few seconds.

Wet splicing with cement fuses the ends of the film together. There is a wide variety of equipment used for this method including small mechanical models and hot splicers; they are priced from about $40 to $400. (Mylar or Ester based films can not be spliced with film cement.)

Splices made with film cement are very strong when properly done. Careful attention to each step according to the splicer manufacturer's instructions is important.

tips for making strong splices

1. With both methods of splicing, be sure the two ends of the film are clean before making the splice.
2. Use proper splicing equipment: film that is not aligned accurately will break or be damaged during projection.
3. When using wet splicing method:
    a. Scrape carefully, but be sure to remove all the *emulsion* and binder from the film base. Scrape the *base* side until the surface is dull.
    b. Completely clean away the scrapings from both sides of the film before applying the cement. Use a small brush, pressurized air, or vacuum to remove all particles.
    c. Use only a small amount of film cement; apply it to the film in one smooth stroke.
    e. Allow the cement to set for 30 seconds
    f. Wipe off the excess cement with a clean soft cloth.
4. Check splices by gently pulling on the ends of the film.

note: Never touch film cement or use fingers to wipe off excess cement. Always wear film gloves to protect personnel.

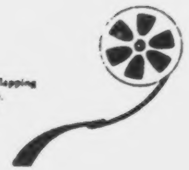
sound loss

If a significant portion of the film has been cut away, there may be some loss of the sound track. Sound is recorded 10 frames ahead of its corresponding visual image, so the loss of sound will occur 18 frames for 8mm, (where the sound track is recorded at the same time as photographed-single system), or 2o frames for 16mm. A preview of the film may be desired to insure picture and sound continuity.

note: Metal parts of a splicer may develop residual magnetization. Care must be taken to demagnetize splicers when repairing magnetic striped films.

blooping

Blooping tape can be used to cover part of the sound track when words or phrases have been inadvertently cut out. Also, many film distributors have replacement footage which can be spliced into the film to replace the missing sound.



Correct overlapping of film splice, when reel is placed on projector.

8o services

Commercial film services offer film cleaning, inspection, and repair. Using these services should be decided by the value of the films, personnel capabilities, and the nature and extent of damage to the film as well as the financial implications.

summary

Once film is damaged its quality, projectibility, and life are adversely affected. Proper handling, maintenance, and storage of both films and projectors will greatly reduce the possibility of damage to your films and provide many added hours of entertainment or learning.
The guidelines presented in this handbook are to help you in establishing a preventive maintenance program for your film library. Specific information on operation and maintenance of equipment can generally be obtained from the manufacturer.

glossary

Audio-Visual Equipment Directory. Published annually by the National Audio-Visual Association, the directory lists and describes over 2000 items. Write to N.A.V.A. 3150 Spring Street, Fairfax, VA 22030, for more information.

Base. A thin sheet of cellulose or polyester used to support the *emulsion* or light-sensitive materials on film. Acetate or polyester are used for modern "safety film." Nitrate, which was used until the 1930's, is highly flammable and should not be used or stored by libraries.

Blooping Tape. A special tape designed to cover the sound track of a motion picture film when there is sound loss or distortion because of a splice. Blooping tape can also be used to edit a word out of a film.

Cartridge. A plastic container with a continuous loop of film. Generally film cartridges contain Super 8mm or 8mm. Each brand of cartridge is different and requires specific projection equipment.

Chattering. A "clicking" sound from the *film gate* of a motion picture projector. It is caused by an improperly aligned or threaded film.

Cinch. To tighten a reel of film by pulling on the free end or with improper use of automated rewind or inspection equipment. Cinching may cause abrasions to the film's surface.

Demagnetizer. An electrical device used to eliminate residual magnetic charges. Improper use of this device can cause distortion or elimination of the sound recorded on magnetically striped film. Follow manufacturer's instructions carefully.

Editor/viewer. A piece of equipment used on a film bench which has a small screen for viewing. Primarily used for editing film, it can also be used for visual inspection.

Emulsion. A layer of light-sensitive materials, usually silver halide crystals in gelatin, which coats the film *base.* The photographic image is formed in the emulsion.

Feed Reel. Also called *supply reel* (same definition as *supply reel*)

Film Gate. The mechanism between the projection lens and lamp which holds each frame of the film flat and in position for projection.

Head. The begining of a motion picture film.

Leader. Blank film used at the head of a motion picture film. Color coded *leader* and *trailer* is often used to indicate whether a film has been rewound and is ready for projection.

Supply Reel. In any manual or automatic film transport system, that reel which holds the film before the system is utilized. Also called *feed reel.*

Tail (end). The part of a motion picture film which is projected last.

Take-up Reel. In any manual or automatic film transport system, that reel which receives the film (from the *supply reel*) as the system is utilized.

Trailer. Blank film used at the *tail* end of a motion picture film to protect that end from damage. Color coded *leader* and *trailer* is often used to indicate whether a film has been rewound and is ready for projection.

references

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With special acknowledgement to Mr. William N. Stelcher, President, Kinetronics Corporation, whose knowledge and support make this hand book possible.

(S.E.)

FILM PRESERVATION

excerpts from October 1980 letter from the Motion Picture, Broadcasting and Recorded Sound Division, Library of Congress.

I have marked the most important handbooks which are Eastman Kodak's on nitrate and safety motion pictures, the FIAF publication FILM PRESERVATION which is published in English by the National Film Archive of the British Film Institute (81 Dean Street, London W1V 6AA) and Ralph Sargent's study done for the National Endowment for the Arts and the Corporation for Public Broadcasting. All three are still valid and valuable.

FIAF, the International Federation of Film Archives, is preparing new publications on the preservation of color motion picture film and videotape. Librarians should be aware that most color dyes used in 8mm, 16mm and 35mm film are very impermanent, having a life expectancy of five to seven years before the fading becomes noticeable. Videotape is even more unreliable although there is very little definitive information about how long it will last. Most of the experts are very pessimistic about its archival nature.

Although the Sargent report is still valid, six years have now passed since it was completed. In a meeting of film archivists held in Ottawa October 3 and 4, 1980, it was proposed that funds be sought to conduct further surveys to learn of new developments in the field. The American Film Institute will coordinate this project. In addition, the International Federation of Television Archives has established a Commission to collect and disseminate information about the preservation of television materials, so there is general consensus that we need to learn more about the archival nature of film and TV.

In response to question three, advise to libraries who discover nitrate film in their collection, I can give you an outline.

First of all they should telephone an institution with experience in handling nitrate film and I have attached a list. The American Film Institute coordinates nitrate preservation activities at several institutions, though they keep no film themselves. They will be glad to act as a clearinghouse of information to help. Any of the institutions I list will be glad to share their experience for handling nitrate film.

Director, Preservation
The American Film Institute
John J. Kennedy Center for the
Performing Arts
Washington, D.C. 20566
(202) 828-4070

Audiovisual Archives
National Archives and Records Service
7th and Pennsylvania Avenues, N. W.
Washington, D.C. 20408
(202) 523-3294

Department of Film
Museum of Modern Art
11 West 53rd Street
New York, New York 10019
(212) 956-4201

International Museum of Photography
George Eastman House
900 East Avenue
Rochester, New York 14607
(716) BR1-3361

The UCLA Film Archive
Department of Theater Arts
University of California
Los Angeles, California 90024
(213) 825-4142

Motion Picture, Broadcasting and
Recorded Sound Division
Library of Congress
Washington, D.C. 20540
(202) 287-5840

It is our experience that many times film thought to be nitrate is actually safety film. In the United States, 16mm film was always safety-base since it was made for school and home use. Eastman Kodak who has manufactured the majority of the film used in the U. S., usually marks "safety" or "nitrate" on the side of the film every few feet. This would be printed in black on positive film (a projection print). All 35mm film manufactured before the middle of 1951 was nitrate base, with only a few exceptions, and it certainly should be suspected of being nitrate until examination proves otherwise. The 35mm film is 1 3/8 inches wide (film narrower than one inch is probably safety film).

Nitrate film goes through stages of deterioration. In the first stage the film becomes discolored and the image fades; in the second, the film begins to stick together; in the third, the film produces a puss-like substance; in the fourth, it congeals into a solid mass; and in the fifth, it turns into a rust-like powder. At the third stage, the film gives off a very strong odor and it is at this point that the deterioration is most evident and as a result is usually reported at this point. Film that has reached stage three has a dangerously low flash-point and can self-combust if kept at above average room temperatures. Such film should be discarded immediately, or the portions of the film which have reached this stage should be removed and discarded by a person experienced in handling nitrate film. If there is no nitrate specialist at hand, the local fire department may be able to help. Disposal may be complicated by local environmental regulations which probably prohibit burning and may prohibit burying the film. Such disposal should be done by specialists in disposing of hazardous materials. Inexperienced persons should never try to dispose of the film by burning it as the film not only burns like an explosion but it also emits highly toxic gases which are very dangerous.

Any nitrate film which is found should be removed from public areas and kept away from valuable collections. Ideally it should be put into cold storage. The best temperatures would be between freezing and 50° F with a relative humidity about 50%. Humidities in the 70% range can cause moisture to form on the film which will hasten deterioration so storage at high humidity should be avoided. The film can be put into a regrigerator but this should only be a temporary measure as air tight regrigerators will not allow the nitrate gases to escape. If the film is kept in refrigerators more than a few days, the doors should be opened occasionally to let the nitrate gases escape.

Sincerely,

Paul C Spehr

Paul C. Spehr
Assistant Chief

HAZARD IN THE HANDLING AND STORAGE OF NITRATE AND SAFETY MOTION PICTURE FILM. Rochester, Eastman Kodak, 1954.

FILM PRESERVATION. London, National Film Archive, 1965.

Sargent, Ralph N. PRESERVING THE MOVING IMAGE. Washington, Corporation for Public Broadcasting & National Endowmnet for the ARts, 1974.

Storage Conditions

excerpt from Sargent, Ralph N.,
PRESERVING THE MOVING IMAGE,
Washington, D.C., Corporation
for Public Broadcasting & the
National Endowment for the Arts,
1974, p.47-48.

Archivists seem to be in general agreement that black-and-white acetate-base films should be stored at about 50 to 60° F. and 55% RH, whereas scientists have recommended an optimum storage condition of less than 0° F. and 15 to 25% RH. However, these storage conditions would present difficulties in handling the film if it has to be taken out for either testing or use.

A carefully controlled, time-consuming conditioning process is necessary to achieve proper moisture/temperature balance when use environments are not identifical to storage environments.

16mm, 35mm, and 70mm rolls were evaluated to determine how long it would take these films to reach 100% moisture/temperature equilibrium. At a temperature of 70° F., a 16mm roll takes about two weeks to achieve equilibrium, a 35mm roll takes about five weeks, and a 70mm roll about 12 weeks. Obviously, such lengths of time are prohibitive for a working archive.

COLOR IMAGES ON ACETATE BASE

The problem of color film storage is severe. Traditionally, photographic experts have stated that the best way to store color film information is to make black-and-white separation masters. This eliminates the danger of dye fading; on the other hand, it increases the cost of storage due to two factors: (1) the color negatives have to be trans-

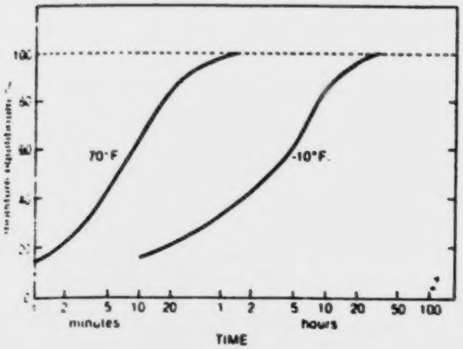
film must be stored instead of one. Further, all three masters must be stored at the same temperature and relative humidity to prevent varying amounts of shrinkage and curl between rolls—which would jeopardize the exacting registration essential to reconstituting a full color image.

If the original color film material must be preserved, various experts recommend that the film be moisture-conditioned to a relative humidity of between 15% and 30%, and then placed in hermetically sealed containers at temperatures of less than 0° F. As of 1970, no such containers are commercially available.

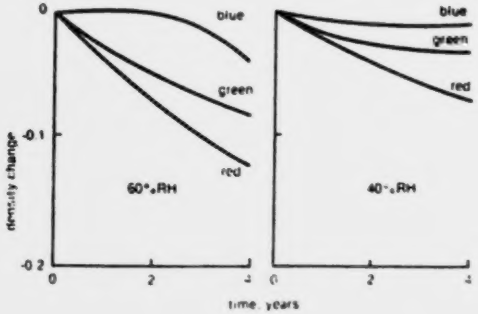
A compromise is to store the color material in a vault at 35° F., 15 to 30% RH. This has the advantage of avoiding the need for sealed cans altogether, as well as diminishing the conditioning problems. (Test data on the suitable length of conditioning time could not be found.) The chief drawback is that maintenance of optimum storage conditions requires a rather expensive control system for temperature as well as humidity in the storage area.

The control of humidity in the storage of color film is very important. Tests have shown that increasing relative humidity produces rapid changes in the stability of color dyes. Strips of color film have been subjected to two varying humidities at 70° F. Over a four-year period at

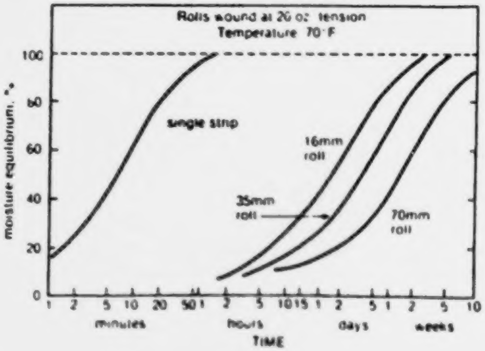
Effect of temperature on rate of conditioning of film. (Single strip)



Effect of relative humidity upon the dye stability of a processed motion-picture negative film at 70°F. Density change determined from an original neutral density of 1.0.



Effect of width on rate of conditioning of motion picture film



60% RH, the density (determined from an original neutral density of 1.0) for blue changed from 0 (ND 1.0) to -0.04, for green to -0.08, and for red to -0.12. The results for the same period at 40% RH were as follows: blue to -0.02, green to -0.04, and red to -0.08. These tests indicate that increased relative humidity has a *detrimental* effect upon the stability of color dyes in general and cyan dye in particular.

A similar test was performed to evaluate the effect of temperature upon dyes, which confirmed that all dyes tended to fade with increased temperature. The cyan dye proved to be the least stable. The higher the temperature, the more acute the dye fading.

BLACK-AND-WHITE IMAGES ON NITRATE BASE

A primary problem with nitrate film is the emission of nitrogen oxides. Nitrate film cannot be stored in hermetically sealed cans since gases cannot escape and will attack the emulsion and base immediately. Storing nitrate film in unsealed cans still does not solve the problem. Ventilation, *per se*, to remove the gases is not sufficiently adequate to prevent decomposition.

Ideally, nitrate film should be stored at a temperature as low as possible above actual freezing point: 33° to 40° F., with relative humidity constant at approximately 50%. This would however make immediate access to the films almost impossible, and the construction of storage facilities extremely costly. Thus a compromise must be made. The major archives report that they store nitrate film at temperatures around 50° F., with relative humidity around 50%. Both values must be controlled very closely. In addition, a constant testing system to evaluate nitrate films for decomposition must be established in order to predict their future life span, or the advisability of immediate copying to safety materials.

TESTING METHODS FOR NITRATE FILM

In an evaluation of various testing methods used to predict the remaining lifespan of nitrate-base film*, two tests were found to be both convenient and reliable—the Alizarin Red Heat Test and the Micro-crucible test. The other testing procedures studied appeared to be either inaccurate—as in the case of the Abel Heat Test and tests for acidity, or too complicated—such as the Small Vessel Test (Semimicro) and the Vacuum Stability Test.

ALIZARIN RED HEAT TEST

This test was simple to apply to a large number of small film samples, and yet was relatively accurate in predicting the film's lifespan. Results of the test generally agreed with the age of the film samples, giving a range of times from 60 minutes and more for new film down to four minutes and less for older films.

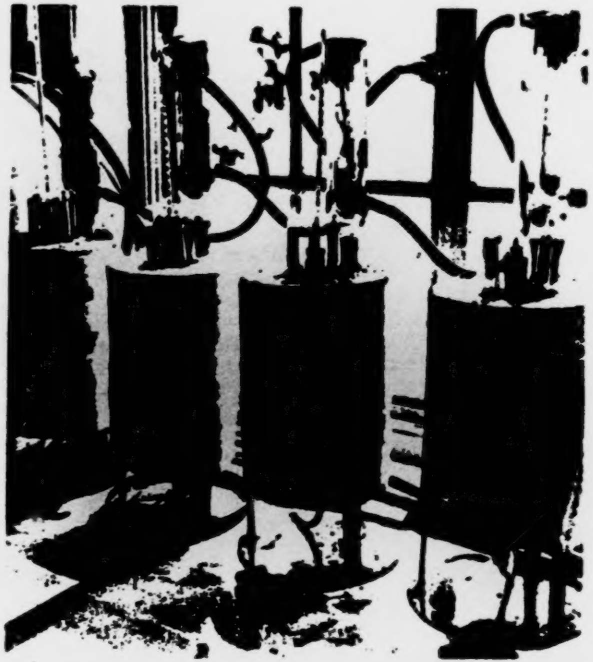
MICRO-CRUCIBLE TEST

Results of this test correlated well with the results of the Alizarin Red Heat Test. It measures the weight loss of a punching of nitrate film after it has been heated, expressed as a percentage of the punching's original weight.

RECOMMENDED PROCEDURES

Hutchison, Ellis and Ashmore suggest the following procedures: After a critical visual examination, the subject film should be given the Alizarin Red Heat Test, using not less than two punchings for two separate tests taken from the middle and the edge of the film. If both tests give a figure of 30 minutes or over, sentence the film for re-examination and retesting after one or two years. If under ten minutes, copy the film and destroy it.

If either result is under 30 minutes, but not under ten minutes, submit a sample to the Micro-crucible Test. If the loss in weight after 168 hours is under ten percent, sentence for re-examination and retesting after six months. If the loss is ten percent or over, copy the film, and then destroy it.



Alizarin Red Heat Test.

G.L. Hutchison, L. Ellis and S.A. Ashmore, "The Surveillance of Cinematograph Record Film During Storage," Journal of Applied Chemistry, *Vol. 8 (January, 1958), pp. 24-34.*

RECOMMENDATIONS

(FOR SECTION ONE) = KEEPING FILM

excerpt from Sargent, Ralph N., PRESERVING THE MOVING IMAGE, Washington, D.C., Corporation for Public Broadcasting & National Endowment for the ARts, 1974, p.79.

1. Without question, polyester is the best available film base material. Its inherent strength, physical and chemical stability, and its freedom from plasticizer loss will allow the archivist greater freedom of choice in the operation of his vault. It will permit less stringent storage and handling conditions—while at the same time extending the useful life of the film.

Polyester shifts the burden of preservation from concern about the base to concern about the image. It is recommended unequivocally that all new photographic moving image materials intended for archival use should be ordered on polyester base.

2. It is recommended that archivists strongly urge the manufacturers of silver halide motion picture products to accelerate their efforts to find a substitute for gelatin as the key binding agent in film. Along with the usual performance criteria, such a substitute must take into account such archivists' concerns as the binder's invulnerability to attack by fungus, air-borne pollutants and other deleterious chemical and physical agents, and the ability to withstand the test of time in terms of durability and adhesion.

3. Films newly acquired by an archive should be rewashed.* If such routine rewashing is precluded by either the archive's resources of manpower or money, it is recommended that all films be tested for determination of residual chemicals.

The best available tests to determine the adequacy of final washing, as well as possible means of predicting the fading potential of photographic materials in archival storage, are the methylene blue test and the silver densitometric test.

4. While, when possible, the FIAF recommendation should be followed for storage of nitrate and acetate materials, frequently individual archives must modify these figures to produce conditions which are manageable within the archive's resources. For this reason, when an archive feels it must deviate from the FIAF standards, it is recommended that:

First, the archive give priority to *consistency* in its archival environment regarding temperature and humidity, even at the expense of some increase in those factors.

Second, should there be a choice between control of temperature and control of humidity, that, within reason, humidity be the first consideration.

Third, new vaults should be constructed away from industrial areas, and areas with air-borne pollution, even at the sacrifice of convenient access.

5. Gold protective treatments applied to silver films, in conjunction with formaldehyde hardening baths, appear to be an excellent means of insuring image permanence—even under relaxed conditions of temperature and humidity. Money should be sought for research into the exact procedure necessary to make such treatments to motion picture films routine.

Further, investigations should be pursued on the various proposed methods for restoring faded and discolored black-and-white silver images. Dr. Edith Weyde's iodine bath restoration technique, and that of the German Democratic Republic, hold much promise in this area.

6. It is a given principle for archivists that the preservation of the original image should be the foremost priority in an archivist's scheme of things. Unfortunately, it is also a given fact that nitrate images will, one day, surely decompose.

One technique has been cited in this book which might successfully prevent the otherwise inevitable result: image stripping.

Research aimed at the development of practical stripping techniques should be undertaken. This concept seems promising, even within the cost parameters given, and, if successful, would indeed save the original image—while transferring it to a far more durable and long lived base material.

7. Archivists should urge the development of a hermetically sealed storage can for acetate-based motion picture film; and along with it, the necessary equipment for utilizing such cans. This type of can could significantly inhibit plasticizer loss, prevent moisture exchange and attack by fungus, and eliminate the effects of air-borne chemical pollutants. Indeed, the adoption of a hermetically sealed can might have profound effects on conventional vault construction by controlling at their source these four of the most insidious enemies of stored film.

Before rewashing color films, consult the manufacturer for recommendations regarding washing and restabilization of the color image.

Vesicular Films and Dry Processes

excerpt from Sargent, Ralph N., PRESERVING THE MOVING IMAGE, Washington, D.C., Corporation for Public Broadcasting & the National Endowment for the Arts, 1974, p.82-83.

DRY SILVER

In recent years, numerous companies have worked on developing photographic processes which are completely self contained chemical and photographic entities. In the case of silver based dry products, the application of light, heat, and cold is sufficient to produce images capable of fulfilling many of the criteria for image quality expected of wet silver processes. From an archival standpoint, these products are too new to have established themselves as proven, workable systems.

Moreover, because of their basic construction, most by-products of the exposure, development, and fixation processes of dry silver remain in the material which presents possible hazards to the archival life of the image. 3M Company and Eastman Kodak Company have been active in the development of dry silver processes.

DIAZO

Diazo processes depend upon the decomposition of diazonium salts, under exposure, to render positive latent images which are made visible by coupling reactions to final dye images. As such, these final images do not have archivally permanent characteristics. In terms of resolution, diazo processes can potentially produce images of higher quality than silver images because diazo images have no grain structure *per se.* Diazo processes can be either wet or dry, but in all cases, the result is a dye image.

A major fault with all diazo materials is the shape of their characteristic curves. No manufacturer has yet been able to produce a diazo film that has a sufficiently linear "straight line portion" to its transfer curve. For this reason, the sensitometry and densitometry of silver and diazo processes do not match, and diazo prints from silver negatives characteristically show grey scale distortions which severly limit the quality of diazo prints.

VESICULAR

Production of images by density is not the only method of achieving photographic results. Techniques which involve a shifting of the refractive index of a material can be employed to produce images of highly acceptable quality.

To illustrate: think of a refractive image as one made up of a multiplicity of prisms, each with a differing geometry. The prisms representing bright areas of the picture would most closely approach a refractive index of one; whereas the prisms representing darker portions of the picture would have a higher index of refraction. When light is transmitted through this multiplicity of prisms, it is bent and scattered at various angles, depending upon the content of the original scene.

The rays representing lighter areas are bent least, and continue to travel forward, toward and through the projection lens; the rays representing darker areas are bent more and only a portion travel forward through the lens, allowing less light to get to the screen.

Actually, practical systems based on the above theory gain their point for point shifts in index of refraction by forming bubbles within their image layer and sealing these bubble shapes with a deformable matrix. It is from this formation of various sized bubbles, or vesicles, that these processes derive their generic name: vesicular photographic systems.

DRY DIAZO VESICULAR

Though not the sole manufacturer, Kalvar Corporation, and its subsidiary, Metro-Kalvar, Inc., are the leading exponents of vesicular images produced by dry diazo techniques for motion picture and television use. Kalvar prints are made by ultraviolet exposure through normal silver negatives. Upon exposure, the diazonium salts decompose, releasing varying quantities of nitrogen gas. This gas is trapped within the saran matrix of the image layer, where, with the application of heat, expansion takes place, producing gas cells ("bubbles") which deform the matrix.

Upon cooling, the deformation of the matrix is made permanent. The final steps of the Kalvar process involve fixing the image by decomposing the remaining, unexposed diazo material and allowing the nitrogen thus produced to escape. Kalvar material gains a permanent image, on a polyester base, free from image elements and residual chemicals which could later deteriorate or be attacked by chemicals that easily destroy conventional silver images.

Unfortunately, there are drawbacks to the above method. Kalvar images are still diazo images in the sense that they exhibit the classic diazo transfer curve. In addition, it is difficult to produce as great a brightness range with these materials as is possible in the case of silver materials.

Another major disadvantage of Kalvar materials is that they require ultraviolet exposure for efficient printing, and it is difficult to sensitize them to blue or red light. Green-sensitive films have been manufactured for laser recording applications, but considerable energy is required to make the exposure compared to the energy requirements for the exposure of silver halides.

A final difficulty inherent in all vesicular systems is that the gamma or contrast of the resultant image is always dependent upon the projection optics used: the higher the f-stop number of the lensing, the higher the gamma. The one exception is Type 63 Kalvar film, made as a direct contact duplicate negative material. This application obviously requires no lensing and therefore the gamma characteristics are more closely fixed; but the material would still be affected by the coherence of the printing light source.

SILVER VESICULAR

Though the phenomenon of producing vesicular images in silver materials has been investigated by various researchers for some time, only recently has any practical solution to the question of permanence been discovered.

The leading worker in this field today is Dr. Edith Weyde of Agfa-Gevaert, Leverkusen, West Germany. The Agfa-Gevaert "W.B. Process" is based upon her work. This is a processing system for the production of vesicular images in silver-image films, based upon silver as the catalyzing agent in the decomposition of hydrogen peroxide. The gas produced by this reaction permanently changes the natural and synthetic binder structure, causing ruptures and vesicles which accomplish the basic requirement of altering the index of refraction of the medium.

Though it is possible for the bubbles of gas to escape from the film if it is accidentally wetted, Dr. Weyde has developed a protective layer to keep them trapped permanently. Even if the gas should escape, the permanent rupturing of the natural and synthetic matrix has occurred, and an image—which can be made visible by the use of Schlerin Optics—permanently remains.

A number of important advantages are inherent in the "W.B. Process":

(1) The system requires one-tenth the amount of silver required for equivalent silver density systems.

(2) Graininess is considerably reduced because vigorous development is not required—in fact, W.B. images can be produced from negatives in which the silver image is not visible to the naked eye.

(3) Because silver is being used as the sensitive medium, all normal sensitization techniques can be employed and the material can be made to have densitometric and sensitometric characteristics identical in every respect to normal silver-image films.

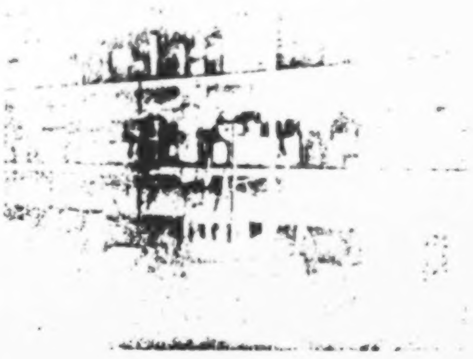
(4) Gelatin need be used only to the extent that it is required to act as a protective colloid for the silver halides; it need not be the total binding agent. In fact, films made specifically for the "W.B. Process" have contained as little as 25% of the gelatin normally found in silver films.

(5) The size and characteristics of the bubble image may be altered during processing to either enhance speed or diminish grain size.

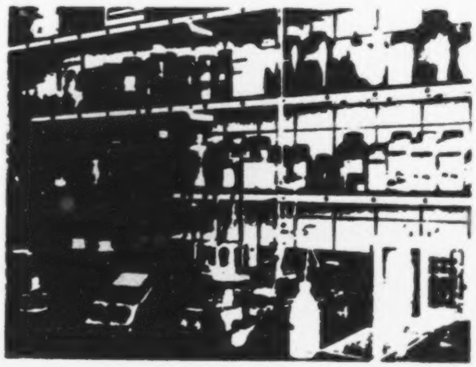
(6) The image can be regenerated repeatedly if, for some reason, the initial bubble image is lost.

(7) The matrix image is always permanent, even if the catalytic silver image is lost.

A print from an underexposed negative before bubble intensification by the W.B. Process.



Print from the same negative after bubble intensification.



from PERFORMING ARTS RESOURCES, edited by Ted Perry.
New York, Drama Book Specialists, Theater Library
Association, v.2, 1975. pp.15-29.

Joel Zuker

Ralph Sargent's *Preserving the Moving Image*: A Summary Review

Walter Benjamin, the distinguished literary critic, translator and essayist, wrote an article in 1931 entitled "Unpacking My Library—A Talk About Book Collecting." In the essay, Benjamin characterizes the joys and frustrations of a devout bibliophile. He tells us: "Only in extinction is the collector comprehended." Benjamin's statement is particularly important in terms of this paper because what he says has as much to do with the concept of film preservation as it does with book collecting. Two-thirds of the theatrical films made in this country are lost forever: 163 million feet of nitrate film (approximately 16,000 titles) are in danger of becoming extinct. Therefore, the work of the film conservationist must take on a much greater significance.

Ralph Sargent[1] was commissioned by the Corporation for Public Broadcasting and the National Endowment for the Arts to identify the source of these problems and propose

ways to correct them. His efforts are intelligently documented in a book published in 1974 called *Preserving the Moving Image*. More specifically, the study was undertaken to:

1. Determine the ideal archival conditions under which to store film. (Sargent has set forth very specific standards for archival storage covering such factors as Resolution, Gamma Range, Density Range, Color Sensitivity and Stability.)
2. Discover more reliable tests to predict the remaining life of nitrate film.
3. Discover new materials or methods now being developed or that could be developed that would replace the admittedly unsatisfactory procedures as they now exist.
4. Establish priorities for funding more research in those areas that seem most promising.

Sargent's text is organized under six main headings: *Base, Binder, Image; Treatment and Storage; Conditions in the Field; New Approaches; New Technologies;* and *Videotape*. In most cases, I have tried to follow a similar outline in preparing this report.

Base, Binder, Image; Treatment and Storage

Motion picture film consists of three elements: a base, binder and image. Each of these impose certain problems for the archivist. The original base used in the manufacture of motion picture film, cellulose nitrate, is chemically unstable, dimensionally variable, and subject to changes in humidity and temperature. In the preparation of nitrate film,[2] a cellulosic material, such as wood or cotton fiber, is treated with nitric and sulphuric acid. Nitrate and acetate films should never be stored in the same area because the gases that are released by nitrate decomposition can destroy the silver image in an acetate print. Cellulose nitrate contains its own oxidant, has a low point of combustion and once ignited is not easily extinguished. Nitrate will continue to burn when completely submerged in water. It is a highly dangerous substance and should be handled with extreme caution. Many valuable and oftentimes irreplaceable films have been lost in archive fires. In the past twenty years, there have been nitrate explosions at the National Film Board of Canada, the Cinématheque Française and at Bulgaria's Nationala Filmoteka; several people lost their lives. Before World War I, scientists introduced a new base called cellulose diacetate, or "safety film." Poor geometric stability, low tensile strength and lack of flexibility made it unsuitable for professional use. In the 1930s, tests were conducted using a mixed cellulose ester of acetate propionate and acetate butyrate. It was more flexible than diacetate but not strong enough for theatrical use. Cellulose triacetate, developed in the 1940s, was completely esterified, but its limited solubility in conventional solvents prevented its general use. In 1948, a slightly less esterified triacetate, "high acetyl," was made available and soon became the preferred base for theatrical production. Unlike nitrate film, acetate does not exert a harmful influence on other films stored in its immediate vicinity. Polyester or polyethylene teraphthalate was invented by Dupont in 1941. It is an oxygen compound of alcohol and carboxylic acid. Polyester is chemically more stable than either nitrate or acetate. It is so strong that ecologists are concerned about its non biodegradable properties. "Without question, polyester is the best available film base material. It will permit less stringent storage and handling conditions—while at the same time extend the useful life of the film." Polyester shifts the burden of preservation from the base to the image. Some archivists feel that additional testing is needed before polyester can be unconditionally recommended.

The gelatin or "binder" is a transparent protective support for the silver halide crystals in the emulsion. It is an organic product obtained from the partial hydrolysis of collagen from the skins, connective tissues and bones of animals. It is 99.96% pure and contaminated with traces of desirable impurities. It is water permeable and thermally

reversible between liquid and solid states. It is not resistant to moisture and can support the growth of damaging fungus. Several products using synthetic substitutes for gelatin have been marketed, but did not prove successful. If proper storage conditions are maintained, the gelatin binder acts as an excellent adhesive substratum.

The preservation of the silver halide image (emulsion) is dependent on correct processing. If poorly "fixed" or improperly washed, the film may become faded or spotted. If carelessly stored, it may be attacked by environmental pollutants. Such deterioration is usually preventable, and where in progress, can be halted and even reversed. Incomplete fixing, residual chemicals or atmospheric oxidants can produce sulfur compounds in the silver images, causing yellowing or fading. Image density decreases and the image may even disappear. If deterioration is not severe, the films may be bleached and redeveloped. Discolored negatives can be regenerated in a solution of iodine and alcohol. The iodine converts yellow silver to silver iodine and the material is then fixed and washed. Black and white images can be restored by a process that uses a strong oxidizing agent and bleaching bath. After washing, the material is immersed in an acidified stannous chloride solution, converting the image silver to halide. It is then rewashed and redeveloped. This procedure can result in a complete regeneration of the image.

Archivists are considering the possible use of "image stripping" as an alternative way of preserving a nitrate print. This involves the removal of the original image layer and its subsequent bonding to a new film base. The original film is conditioned and repitched to standard perforations and temporarily bonded with the emulsion side down to a traveling pinned belt. Solvents are applied to the nitrate base to permit a stripping away of the image layer. After resubbing, the image layer is bonded by heat and compression to a new and stronger base. The bond between the original emulsion and the pinned belt is broken and the film is removed, washed and dried. Another method of image stripping involves essentially the same procedure, except that the original film is bonded to a new base with the

emulsion side up. The two bonded films are removed fro
the pinned belt and placed in a solution that dissolves t
old nitrate base but does not disturb the adhesion betwe
the original emulsion layer and the new polyester ba
Both approaches are extremely time-consuming and expe
sive, but the second is probably more satisfactory becau
fewer steps are required to complete the process.

For the archivist, the treatment and storage of color fi
constitutes a very special problem. Sargent indicates in h
recommendations for Section Two that "even the be
specialized storage conditions will do no more than temp
rarily preserve color dye images." Color films made on
acetate base should be stored on separate black and wh
negatives—one for each of the three primary colors. Th
process is expensive and increases the amount of spa
involved for storage by a factor of three. Also, temperatu
and humidity must be rigorously maintained between t
three negatives, or differential shrinkage and curl rates w
prevent reconstitution of the full color image. To preser
the original color material where separations are not prac
cal, the film should be conditioned to between 15 perce
and 30 percent relative humidity and stored in seal
containers below zero degrees Fahrenheit. Obviously th
kind of optimal situation is impossible to maintain. Hum
ity control is especially critical. Color films were tested
various levels of humidity at a temperature of 70 degrees
a period of four years. The results indicate deterioration
dyes, particularly cyan, increased at higher moisture leve
Tests documenting the effects of changes in temperature
dye stability, show that they are less stable at higher te
peratures.

There are several approaches to color separations:[3] o
relies on the creation of three negative images of the p
mary color information, whether on separate rolls of film
sequentially on one roll. The 70mm Color Separati
system proposed by Film Effects of Hollywood, uses sta
dard four sprocket 70mm film, allowing a 1:1 contact pri
ing of the sound track. This format would require only
18 percent reduction in frame size from 35mm origina
with minimal loss of information. The original can

printed by the "wet-gate" method, exposing the three horizontally parallel primary color frames at once. Full color images would be retrieved by superimposition of the separation images, with the same sort of optical arrangement and color separation filters. In addition to reducing the amount of space required for three separation negatives, this procedure eliminates the possibility of differential rates of shrinkage and distortion, possible loss of one of the separation copies, and inaccurate synchronization in regenerating a positive print.

Another system that can be used separates the color image into a series of analytic units that are encoded by a laser beam onto 35mm film. The angular displacement of these records creates a diffraction grating that later can be separated with spatial filters. RCA superimposes three focused-image holograms, of the separated primary color information, in a single frame using different grating frequencies. Readout is accomplished on a microfilm reader, with white light modified with special optics.

Images can be stored by Electronic Video Recording, or by a combination of optical and electronic techniques. This would permit reconstitution to conventional images and projection on large screens. If the records are made on 35mm film, the scanning pattern may utilize up to twelve hundred lines of information. Experiments conducted by Peter Goldmark, former President and Director of Research at CBS, used Ilford black and white film—a fine grain negative with a gelatin emulsion that is exposed by an electron beam. This procedure requires one-third less storage space than conventional separation systems and may be preferable where image quality can be compromised for projection to small groups. Some archivists believe that color has replaced nitrate as the key issue of film preservation. There is not as yet one definitive solution to the problems. Sargent does state that for color films of acknowledged intrinsic value three strip separations are the only reliable approach presently available. Again the author mandates responsible agencies to provide the necessary funds to conduct additional research in this area.

Conditions in the Field

The next section of *Preserving the Moving Image* is concerned with current conditions in the field. Sargent has provided written transcripts of interviews that he conducted with film archivists in Brussels, London, Rome, Amsterdam and Berlin. Each of the following statements reflects in a particular way some of the serious problems facing film repositories throughout the world:

Jacques Ledoux (Cinématheque Royale de Belgique):

> We are very short of personnel. It is very nice to design a system but you need the people to make it work. We do not even have a catalogue of films . . . I think that if you really want to get a picture of the work of an archive, you cannot limit yourself strictly to preservation aspects. This is why I have talked about our side problems—you cannot disconnect them.

Jan de Vaal (Nederlands Filmmuseum):

> A collaborator of ours once phoned me from the technical department to report that he had found a newsreel—Eisenstein visiting Holland in 1929. I was, of course, very enthusiastic and knew we had to do something. He told me not to worry because we had tested it and the results were fine. Because it was such an interesting item, we decided to dupe it anyway. After one year the original was gone completely.

Fausto Montesanti (Cineteca Nazionale):

> I'm an old man. I'm leaving from this world soon. But I'm leaving with my heart in pieces because I can't obtain the necessary funds to dupe everything we have. We have a big collection of Italian silent films, but no money to dupe them.

Wolfgang Klaue (Staatliches Film Archive der D.D.R.):

KLAUE: The problem with storage of color film is that you must have low temperatures and limited humidities (around 30 percent). This creates all kinds of scientific and technical problems.

SARGENT: Given those conditions what will the life expectancy of the films be?

KLAUE: Nobody knows. There was no practical experience until now. There has been some theoretical research done, but nothing practical.

Ernest Lindgren (National Film Archive):

> Under the voluntary system of deposit that we have here, we don't get all that we select or all that we ask for. This is something that we are trying to remedy by acquiring powers of legal deposit such as are already enjoyed by books in the British Museum.

These interviews also serve to correct certain misconceptions regarding the work of a film archivist. He is not merely a custodian of old motion pictures but is usually involved with problems of appraisal, acquisition, funding, exhibition, cataloguing and other ancillary activities.

New Technologies; New Approaches

Section two of the Sargent book examines new techniques for preserving motion picture film. These new advancements will enable the film archivist to preserve and reproduce images with greater efficiency. It will also permit the scholar to study these images in formats incorporating ease of viewing and accessibility at a relatively moderate cost. Sargent proposes three separate archival standards. Archival Medium #1 is for high quality, long-term storage. It will have a resolution of 1200 cycles (line pairs) per horizontal field, and will be the source from which copies can be made. Archival Medium #2 is designed for projection to small groups, such as a classroom situation. Resolution is 600 cycles per horizontal field. Archival Medium #3 is for individual scholarly use. Resolution is 350 cycles per horizontal field. All three categories use materials that have excellent organic properties. Problems such as decomposition, temperature and humidity control, and deficiencies in binder stability are significantly reduced. Many of the systems discussed in this chapter are in various stages of research and cannot at this time be recommended as a replacement for the more traditional methods of recording an image on film. Certainly the most recurrent problem that prohibits the implementation of these new technologies is one of economics. The new systems are not only expensive to produce but in certain cases, such as electro-optical image storage, expensive to maintain.

The Kalvar Corporation in New Orleans has been experimenting with a photographic system which replaces the standard silver halide process with other light sensitive compounds. The theory behind the production of vesicular film images is based upon the shifting or reorganization of microscopic regions of the image layer, resulting in an alteration of the refractive index:

> To illustrate: think of a refractive image as one made up of a multiplicity of prisms, each with a differing geometry. The prisms, representing bright areas of the picture would most closely approach a refractive index of one, whereas the prisms representing darker portions of the picture would have a higher index of refraction. When light is transmitted through this multiplicity of prisms, it is bent and scattered at various angles depending upon the content of the scene.[1]

When Kalvar film is exposed to light certain quantities of nitrogen gas bubbles or vesicles are released. These microscopic bubbles which act as light-scattering centers are trapped within the thermo-plastic matrix of the image layer. Development of the latent image consists of the application of heat to the film, which causes the gas bubbles to expand and permanently deform the matrix of the image. From an archival standpoint, the use of Kalvar film has certain obvious advantages over current procedures:

1. The image produced by vesicular film will not deteriorate for 600 years. (Acetate film or "safety film," if kept in optimal storage conditions, may have a life span of approximately 200 years.)
2. After 2400 passes through a viewer—simulating 150 hours of projection—there was no loss in image quality.
3. The polyester base on which it is manufactured will not tear or rip apart.
4. The durability of vesicular film increases with age. Samples of vesicular film made in 1954 had a thermal resistance of 60% when tested at a temperature of 131 degrees Fahrenheit. When the same film was tested twenty years later under similar conditions of temperature and humidity, the thermal resistance was now 100%.
5. Because the image is not supported by a gelatin layer as it is in silver halide film, the potential growth of fungus is eliminated.

The disadvantages of Kalvar film are:

1. A problem of sensitization to particular colors.
2. Its brightness range is not as great as standard silver grain film.
3. Limited resolution in comparison to other photographic processes.
4. Cost.

Kalvar film is relatively new and its application to archival needs is still highly speculative. In his recommendations at the end of Chapter Two, Sargent strongly supports continued research in this area.

Another information storage system that could be adopted for archival purposes is presented in an interview that Sargent conducted with George Tressel, of Battelle Memorial Institute in Columbus, Ohio. The Battelle system of digital storage seeks to replace the more traditional method of analogue preservation. The difference between the two systems can be illustrated by setting up a hypothetical problem, concerning the preservation of information contained in a simple folktale. A folktale, by definition, is a story that has been passed down by word of mouth, from generation to generation. Each time the story is told, there is a slight variation in narrative content. After a few generations the original folktale is significantly altered. A comparison can be made to the analogue procedure of producing a "duped print" which is slightly different from the original film. However, an encoding system can be used that will insure the preservation of the original material. In the example of the folktale, an encoding system is achieved by simply writing the story down on a piece of paper. Now that the information contained in the folktale has been converted to a code, i.e., a series of written words, the story can be reproduced without losing any of the original information.

The Battelle system uses a laser beam, a mechanical scanner and computer circuitry to store information in a digital format. The mechanical scanner "searches" the film and breaks the image down into a series of x, y coordinates. The information is recorded as a series of binary dots. The original image can be reconstituted by reversing the process. A light beam is passed over the computer record and a photo-detector picks up the light patterns, converting the image record to an electronic signal. This signal is then transmitted through an ordinary television receiver. The image is rephotographed from a cathode tube.

The specific application of this storage system for archival needs is rather intriguing. In regenerating the original image, one can obtain a high degree of resolution, as in 70mm projection or low resolution, as in videotape. While there is no way of improving the original image, there might be a way in which the system can be used to reconstruct missing segments from a motion picture. Again, let us take a hypothetical situation. A film historian/detective is able to uncover certain information that was used in the production of a particular scene. He would be interested in such factors as production notes, shooting script, camera model, lenses, film stock, weather conditions and so forth. This material could be supplemented by interviews with various technicians who worked on the film. A computer program could be designed which would use all this information in reconstructing the missing segment. A similar procedure has been used by paleontologists in recreating the morphological anatomy of prehistoric animals. The direct application of a digital system, both as a method of preserving film and in the possible restoration of lost footage, is still highly speculative when compared to other available and more proven procedures. As far as the Battelle system is concerned, the breach between theory and *praxis* is still a very real problem. Yet, if this process is ever made operable, the work of the film archivist will take on an entirely new perspective. He will not only be responsible for preserving our film culture but through editorial restoration provide additional materials for study.

Videotape

The last section of the Sargent report is concerned with the technology and preservation of videotape. The author makes it quite clear that our knowledge regarding the archival properties of magnetically recorded images is, at best, cursory. Many questions relating to its adaptibility, to present demands, are still left unanswered:

> Not until recently has the matter of archival storage been seriously considered by the manufacturers of videotape. Not only are age performance records sloppy, but tests for such performance have not, in many cases, been pursued. . . . Thus those charged with preserving videotapes are doing so "by the seat of their pants," and no confirming test results nor accurate predictions on the long-term keeping qualities of videotape are to be had.[5]

Certainly, one of the most important problems identified in Sargent's introductory comments is the need for greater standardization of existing videotape systems.

> Nearly 100 different models of helical-scan VTR's are presently on the market. Tape widths range from one-quarter inch to two inches. Tape speeds range from 1.26 inches sec. to 15 inches sec. Playback times range from 20 minutes to 4,560 minutes (76 hours). There are six different TV standards and four color systems.[6]

When one takes into consideration all the variables sug gested here, the problem of preservation becomes one o great complexity. The preservation of motion picture film in comparison to videotape, seems more manageable. Tests conducted by the National Archives and Records Servic "show that approximately 20 percent of a given populatio of videotape is scrapped each year." This figure is deter mined by such factors as poor wind, stretching, dust accu mulation and deterioration produced by changes in tem perature and humidity. Magnetic tape is also highl flammable and the same precautions should be taken i storing videotape as with photographic film.

Sargent indicates that an accurate prediction of th longevity of videotape recordings is between ten and 1 years—a time period which has little or no relevance i archival terms. The temporal quality of magnetic tapes is s restrictive that in many cases they are being converted t 16mm film, in order to guarantee their preservation. Vide tape to film transfer can be accomplished by a laser syster an electron beam recording and a kinescope procedure tha records directly off the face of the cathode tube durin broadcast.

Unlike the problems of photographic film, a specifi solution to the inherent difficulties of videotape preserv tion is not predicated entirely on more funding. Even i further experimentation were conducted, the fact remain that videotape, in its present form, has an abbreviated lif span and thus has limited value as a potential source fo archival storage. Sargent concludes this section of his report with the following recommendations:

1. It now seems clear that for television originated programming, videotape cannot be relied upon as the master archival medium for permanent storage. Programs chosen to be held for long-term storage must be transferred to film.[7]
2. The best method for accomplishing this—for both black-and-white and color—is to make color separations by means of Electron Beam Recording, because it produces a directly accessible silver image of known archival value.[8]

In one of the scenes of Bertolt Brecht's *Galileo*, there is a discussion between the astronomer and Federzoni, his lens grinder. Galileo says: "The aim of science is not to open the door to everlasting wisdom, but to set a limit to everlasting error." This seems to be the basic task that Sargent has set for himself in writing this book. *Preserving the Moving Image* also seeks to limit everlasting error by establishing clear and cogent guidelines for the scientific conservation of our motion picture heritage. It is unquestionably the definitive study on the subject. All proceeds form the sale of the book will be used by the Corporation of Public Broadcasting and the National Endowment for the Arts to conduct further experimentation with the problems of film and videotape preservation.

Notes

1. Ralph Sargent received his undergraduate training at the University of North Carolina and completed a Master's degree at the University of California at Los Angeles. In 1965-66, he developed, for UCLA, the first high-power, arc-illuminated, 8mm motion picture projector. During 1967-68, while still at UCLA, he invented an automatic exposure control system which, in conjunction with a modified Metro-Kelvar printer, provided completely automatic printing and processing of dry motion picture film. Between 1965 and 1968, he was Production Supervisor for the University of

California Motion Picture Division, and from 1968-71, a Lecturer in the school's film section. He left UCLA in 1971 to form Film Technology Company, Inc. The company offers post-production services and specialized printing for the motion picture industry and for various film archives. Sargent has had experience in both the creative and technical aspects of motion pictures, television and radio.

2. The present procedure for preserving nitrate film is to recopy it onto an acetate base.

3. Many of the procedures discussed in this section are highly theoretical and require additional research.

4. Ralph Sargent, *Preserving the Moving Image*, ed. Glen Fleck (Washington: Corporation of Public Broadcasting and the National Endowment for the Arts, 1974), p. 82.

5. *Ibid.*, p. 131.

6. *Ibid.*

7. *Ibid.*, p. 149.

8. *Ibid.*

Recordings

UNIVERSITY OF WASHINGTON LIBRARIES

LISTENING CENTER RESTORATION AND PRESERVATION PROJECT

John R. Gibbs
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The techniques of sound recording preservation and restoration became of interest to the library when, in 1978, we were able to acquire two major collections of early recordings. The Harris Wind Music Collection is a collection of early recordings of performances on wind instruments; either solos or major orchestral excerpts demonstrating particular instruments and/or playing styles. The second collection, donated by Eric Offenbacher, a noted collector of Mozartiana, is of over one thousand recordings of vocal music composed by Wolfgang Mozart. A large portion of these collections date from the "accoustical era" of sound recording (before 1927) and each contain several examples of recorded incunabula. With the prospects of having two significant collections added to our holdings, it became important that we investigate means of preserving these documents and at the same time restore any portion of the audio content that was covered by excessive transient noises, poor equalization, and excessive groove wear.

PRESERVATION

All sound recording materials are susceptible to physical degradation due to atmospheric factors, fungal action, handling and storage, manufacture, and properties of plastics. Sound recordings are preserved in two ways: 1. by storing the original document under the best possible conditions and by 2. recording onto magnetic tape the audio content of the document.

The discs are stored in lockable enclosed cabinets which serve as protection from most atmospheric contaminants, ultraviolet light, dust and grit. The Listening Center atmosphere of 50% relative humidity and 70° F., with minimal thermal cycling and air conditioning, is ideal for the storage of most early sound recordings. The exception to this is cylinder records, which should be stored at a lower relative humidity due to their composition. A silica dessicant is used to lower the humidity level in the cylinder storage area. A Bendix model 594 Hygro-thermograph is used periodically to record humidity and temperature (See Append. A).

At present the entire Harris Collection and a small portion of the Offenbacher Collection are contained in acid-free sleeves. Since sound recordings are composed of organic matter similar to that of the printed page it is essential that traditional high acid content cardboard sleeves not be used.

The restored tape copies are wound onto enclosed plastic reels with 10 cm. hubs to protect the tape and provide low torque on the inner windings of tape. (See Append. B for suggested recording standards.) Test tapes are stored with the collection and are monitored to determine if the recordings are being affected by print-through or stray magnetic fields.

RESTORATION

The objective of sound restoration is to achieve the best sound possible commensurate with faithfulness to the original performance. Although there is no way to recreate the live recording session, an effort is made to maintain musical integrity while removing extraneous noises. Modern listeners familiar with high fidelity recordings are frequently unsympathetic to earlier recordings. These recordings often contain so much extraneous noise that satisfactory listening experience is impossible.

In order to provide the listener with a more satisfactory experience, three basic parameters of the sound recording must be controlled to reproduce the information contained on the disc in a correct and useful manner: speed, groove shape, and equalization. Extra-musical sound or transient noises which may be present in the recording appear throughout the audio spectrum, requiring a variety of electronic processing equipment for adequate attenuation or removal.

Early recordings were made at a variety of speeds ranging from 60 rpm to over 90 rpm. Once the correct playing speed is determined, the variable speed turntable (Thorens TD 126C) or cylinder player (a modified Ediphone) is set through the use of strobe discs. In the case of some very early recordings made with hand cranked machines, the variation must be controlled by hand to compensate for the lack of constant speed.

Non-standard groove shapes and excessively worn grooves require the use of a variety of stylus shapes and sizes. The "stylus library" of sixteen different sizes provided by Expert Pickups (truncated styli ranging in size from 2.5 mils to 16 mils) permits the restoration technician to select a stylus that best fits the grooves of the record. The lateral/vertical switching mechanism on the Packburn Transient Noise Suppressor Model 101 is used to audit the effects of stylus shape on sound reproduction and to optimize stylus selection. Additionally, an Ivie IE 30A 1/3 octave Audio Spectrum Analyzer is used to check the frequency response of the matched groove and stylus combination.

With the advent of the electrical recording process in 1925 it became necessary to equalize the playback response; an inverse of the recording characteristics was approximated during playback. Each electrical process and each record manufacturer had their own ideas regarding bass rolloff, treble pre-emphasis and crossover frequencies. A log of all known equalization curves is kept and recreated through the use of a graphic equalizer (MXR 2/3 octave Equalizer).

To remove, attenuate or otherwise suppress transient noises throughout the audio spectrum four electronic devices are used. The Packburn Transient Noise Suppressor is the most important piece of equipment in the process. The Switcher portion of the Packburn removes high frequency "crackle" by choosing the quieter wall of the groove. The "Blanker" portion suppresses short durationed high frequency bursts such as "Pops" and "Clicks." The Orban 672A Equalizer is a "paragraphic" equalizer featuring variable frequency and bandwidth within a ±16 dB equalization range; it is used to suppress selected frequencies and to remove noises from outside of the recorded spectrum. The Universal Audio "Little Dipper" Filter Set is used for additional high/low pass filtering at 18 dB/octave. This unit, with two six function variable frequency notch/bandpass filters, can be used as a selectively boosting equalizer or to remove resonant frequencies. A Phase Linear Autocorrelator 1000 removes high frequency uncorrelated sound from within the recorded spectrum by means of sophisticated dynamic filtering.

The disc or cylinder is processed using the above equipment while it is simultaneously recorded onto magnetic tape. One stereo signal contains the restored musical information while a second channel is recorded in its natural state so that comparisons can easily be made between the restored version and the original version.

The equipment used in the Restoration Lab is sufficient for most types of recordings and restoration problems encountered. Additional truncated styli of various applications are added as the supplies budget permits.

In the brief history of the Restoration Laboratory, over 1000 tapes of restored sound recordings have been produced. The majority of the tapes were produced in connection with the Offenbacher Collection. Many recordings have been used by faculty members in the School of Music for class presentations. Special projects have included work on the Proul Collection from Manuscripts Division. The restoration process was applied to recorded materials from F.D.R.'s cabinet meetings for a history professor, R.J.C. Butow, and a restored tape was used as evidence in a consumer fraud case for the State Attorney General's office. The Restoration Laboratory is currently participating in the Libraries' 1981/82 HEA Title II-C grant. In this project, field recordings of Native American languages from the Melville Jacobs Collection, in both cylinder and disc form, are being restored and transferred to tape.

2/18/82
JRG:pr

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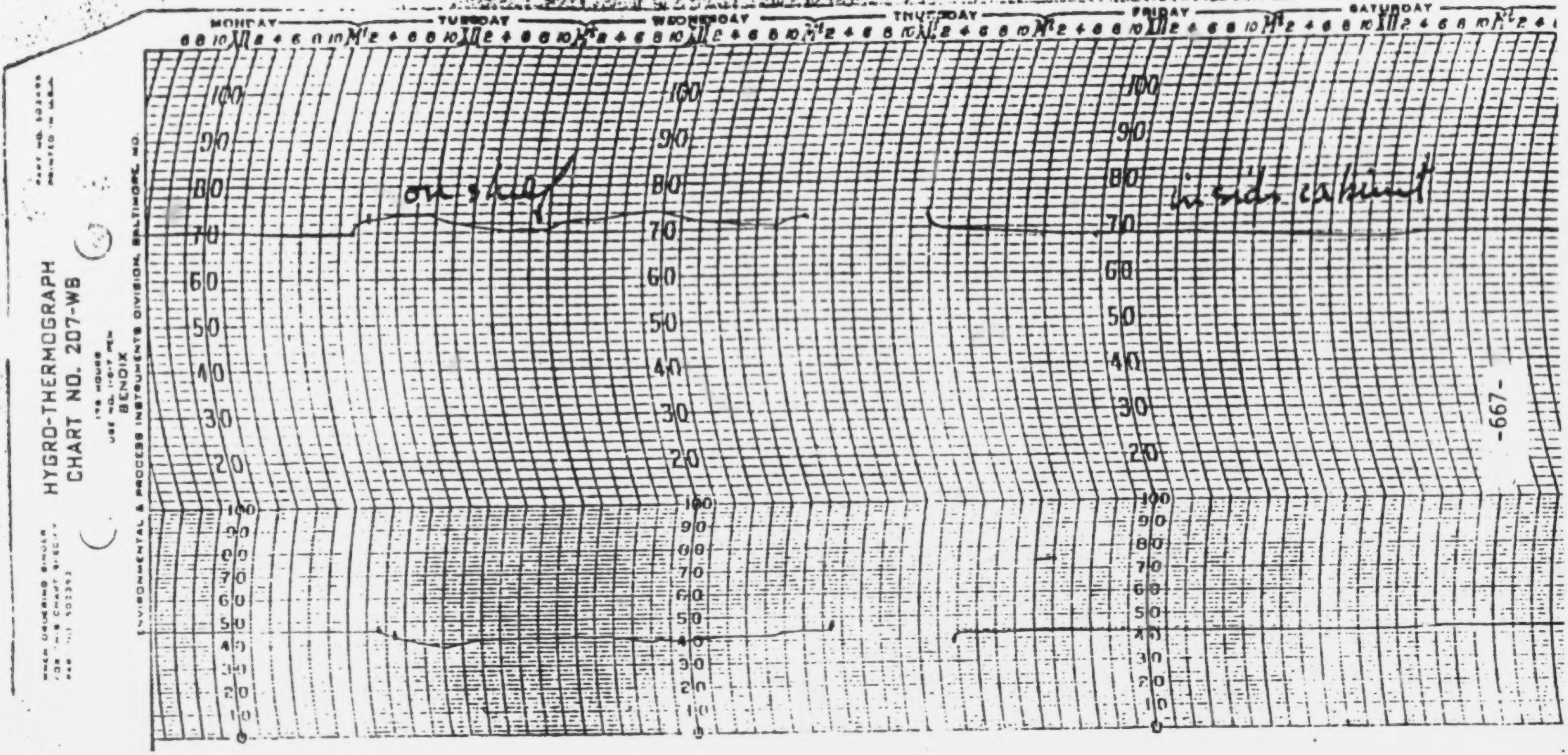

Appen. A. An example of the relative stability comparisons. Measurements takem on open shelf and inside closed cabinet used to store archival recordings.

[illegible]

These standards are used for all archival recordings in Listening Center.[1]

iasa technical committee

STANDARD FOR TAPE EXCHANGE BETWEEN SOUND ARCHIVES

The exchange of tapes between archives often causes organisational and technical problems. There are many practices of processing tapes amongst sound archives and even more different ways of providing tapes for other archives.

While the ideal, from the technical point of view, would be to receive a tape that can be put on the shelves without further treatment, different archival standards and practices have not always made this possible. To obtain specific formats and standards additional correspondence often was necessary.
For example, archives tended to send half-track recordings (sometimes on LP tapes) to save money for materials and postage. This made it necessary to dub the recording a second time for archival purposes, thus further deteriorating the original fidelity.
Obviously this latter practice turns out to be the most expensive one in the long run.

Pursuing an idea of its member Robert D. Carneal, IASA's Technical Committee therefore undertook a survey of archival practices of some US and European sound archives and proposed a draft standard on tape exchange at the Bergen Conference in August 1976 (Dietrich Schüller, Towards a Standard for Exchange Tapes between Research Sound Archives, Phon. Bull. 16/1976). Some comments were received during the year and at its meeting at the Mainz Conference the Technical Committee agreed on a standard for tape exchange between sound archives.

In compiling the standard the idea was:

1) to produce tapes that can be archived without further dubbing
2) to produce tapes that should be compatible with the individual archival practice of the receiving archives
3) to give recommendations for archival practices to smaller, or new, archives
4) to expedite ordering and dispatch of tapes, as no further specification would be required other than that the tapes be prepared according to IASA Tape Exchange Standard.

The Technical Committee is aware that amongst radio archives standards already exist. It was felt, however, that these standards would not necessarily meet the requirements of maximum precautions for long-term storage, while on the other hand the differences between European and American archives had to be considered.

This standard is a recommendation only. An archive may, of course, ask for tapes with different technical data and some archives may not yet be able to provide tapes according to this standard. But any other practice will cause extra correspondence, delay, redubbing etc and thus in the long run make for greater difficulties.

---

[1] International Association of Sound Archives Phonographic Bulletin. December, 1977.

TAPE EXCHANGE STANDARD

General: Straight dubbing of the original signal shall be standard. If for any reason filtering has been done, exact details have to be given.

Tape:

1.5mil (52µm) standard play (SP) tape, polyester base, low print.

Splice free, no leader tapes.

Approx 10 metres or 1 minute (at 7.5ips, 19cm/sec) blank tape at beginning and end of tape.

Tape position "tails out" (wound on the take up reel)

> Comments: The definition of standard play tape with low print characteristics is beyond the scope of present discussion. IASA's Technical Committee does not recommend specific products, but will, however, undertake a comparative test between tapes that are normally recommended by manufacturers and archives for long term storage. It is hoped to publish the result of these tests at IASA's Annual Conference 1978 in Lisbon. Splice free tapes without leaders have been specially requested by American archives. Since approx 10 metres at the beginning and end of each tape are to be left blank each receiving archive may add leaders according to its own practice. Tails out (storage of the tape on the right hand take up reel) is in many respects advantageous. Tape tension normally is weaker in the play mode and the tape - especially shiny-backed tapes - do not show displaced turns ("leafy winds").
>
> Furthermore storing this way forces the user to rewind tapes immediately prior to replay thus reducing the print through in the process of getting the tape in the proper position for listening or copying.

Reels:

7" (18cm) plastic reels or 10.5" (26.5cm) plastic or metal reels for longer programmes.

> Comments: Reels less than 7" (18cm) have correspondingly small hubs that may cause undesirable increase of torque and consequently tape tension. The majority of reels have slots in their hubs that may cause unwanted deformations in the tape layers close to the hub. Therefore, when available, slotless hubs are to be preferred. Metal reels are liable to irreversible deformation as a result of being dropped or knocked. Despite satisfactory experience of sending tapes on open hubs among continental European radio stations, this practice should be avoided in intercontinental exchange.

Container and Shipment:

Low acid cardboard, reel in polythene (Polyäthylen) bags.

> Comments: The use of commercial plastic containers was rejected since they may acquire electrostatic charges, thus attracting dust. Cardboard containers furthermore are shock absorbing. For maximum dust projection only polythene (Polyäthylen) bags should be used. Metal reels and open hubs need better shock protection than plastic reels. For minimum shipping time and comparatively careful handling, air-mail is to be preferred,

especially for intercontinental exchange.

Speed:

7.5ips (19.05cm/sec) or 15ips (38.1cm/sec).

Comments: While in most cases 7.5ips will be satisfactory, 15ips should be considered for ultimate quality.

3 3/4ips (9.5cm/sec) is not recommended. The requesting archive should specify the speed wanted if other than 7.5ips.

Equalisation:

NAB or CCIR (IEC).

Comments: Most archives can only produce recordings with optimal quality in one equalisation standard. Thus it is more practical to produce exchange tapes with the equalisation normally employed and for the receiving archive to align (or switch over) one machine to the other standard to be able to play back foreign tapes.

Track Formats:

Mono: full-track.

Stereo: 1.91mm (NAB) or 2.75mm (CCIR) half-track-stereo.

Comments: While there will be no problems for archives employing the NAB standard in handling CCIR stereo tapes, it is desirable for European archives to have one machine with NAB standard heads to avoid additional tape hiss.

Reference Signals:

As a level reference a 1kHz sine-wave signal of 10 secs duration shall be set to 3VU below actual peak level of recordings in the case of monitoring with VU meters, or to 10dB below actual peak level in the case of monitoring with Peak Programme Meters (PPMs). After 10 secs of blank tape a 10kHz sine wave signal of 30 secs duration at the 1kHz reference signal level shall be recorded. Further reference tones (see noise reduction systems) or the first item of programme shall start after 10 secs of blank tape.

Comments: A level reference signal indicating the actual peak level of the recording will indicate the actual maximum flux of the recording. No minimum or maximum fluxes are specified since "high output" tapes are not used for archival purposes. Thus the peak magnetization of exchange (and archival) tapes normally will be between 320 and 640pWb/mm track width. The 10kHz signal allows adjustment of azimuth setting.

Noise Reduction Systems:

To be offered by the sending archive only for tapes that were originally recorded with noise reduction systems. Reference tones (e.g. Dolby reference level) shall follow the azimuth tone after an interval of 10 seconds.

Identification:

Short identification written on tape, reel and container shall contain: name of sending archive, list of contents, number of tape reel if necessary. Separation of single items with 40 to 70Hz sine-wave signal of 5 secs duratio spaced 5 to 10 secs from the items to be separated at same level as the 1kHz reference level. Cumulative time index starting with 0.00 minutes at beginning of 1kHz reference level.

> Comments: The frequency range of 40 to 70Hz for the separation signal has been agreed to accommodate already existing practices at the low end (40Hz), which is high enough to be heard when played back in normal speed.
>
> The upper limit (70Hz) was chosen to keep the signals comparatively low when monitored in the fast running mode. Thus, by counting the "peeps" during fast winding, the required item can easily be found even on machines without linear time counters. The space between separation signal and programme items was chosen to enable the receiving archives to cut leader tapes in between if required.

Users' Information:

Full technical data of original recording and all copying processes shall be given (see Appendix B).

Appendix A

Schematic Display of Signal and Programme Arrangements on Exchange Tapes:

beginning of tape		
blank tape	10 metres	(≈60 secs at 7.5ips)
1kHz reference level [x]	10 secs	starting point for the cumulative time index
blank tape	10 secs	
10kHz azimuth tone [x]	30 secs	
blank tape	10 secs	
(Dolby reference tone	10 secs)	
(blank tape	10 secs)	
first item	x secs	
blank tape	5-10 secs	
separation signal	5 secs	
blank tape	5-10 secs	
second item	x secs	
et cetera		
last item	x secs	
blank tape	10 metres	(≈60 secs at 7.5ips) with written short identification spaced 1 meter from end of tape

[x] both levels -3VU or -10dB re to actual peak level of recording.

Recommended Environmental Conditions and Handling Procedures for Magnetic Tape

Since the subject of the preservation of videotape is a relatively new one, little work in this area has reached the advanced discussion stage, let alone print. In our conversations on the preceding pages with videotape manufacturers, as well as with the Ampex Corporation, few hard facts emerge. One of the most helpful and thorough documents discovered during the course of the preparation of this book is the discussion draft of "Handbook of Recommended Environmental Conditions and Handling Procedures for Magnetic Tape," prepared by Gerald Rosenkrantz of the Data Archives Branch of the National Archives and Records Service, Washington, D.C. Though it deals primarily with magnetic tapes manufactures for digital computer use, many of its recommendations apply equally well to videotape.

Mr. Rosenkrantz indicates that much of his information was supplied by the Ampex Corporation, IBM Corporation and the 3M Company.

excerpt from Sargent, Ralph N.,
PRESERVING THE MOVING IMAGE,
Washington, D.C., Corporation
for Public Broadcasting & the
National Endowment for the Arts,
1974, p.139-142.

Environmental Conditions for Tape Storage Rooms and Buildings

1. Tape storage vaults and rooms shall be temperature and humidity controlled. A positive internal air pressure is desirable to prevent any dust intrusion.

2. Temperature range shall be 70° ± 10° (vaults), 70° ± 20° (work room). Wet bulb temperature shall not exceed 80° F.

3. Humidity range shall be 50% RH, ±10%.

4. Dust and dirt controls shall keep dust particles to 50 microns.

5. Areas used to store or condition magnetic tape should have in operation continuous temperature and humidity recording equipment.

6. Magnetic tape should be protected from high intensity magnetic or electrical fields. These include power generation facilities and transmission lines, radar installations, bulk degaussers, and magnetic check sorters.

7. Metal tape storage racks should be electrically grounded, and at least a two-foot separation should be maintained between all electrical fixtures and power lines and the storage racks.

8. Tapes must be stored in an upright position, not flat on their sides.

9. For any storage in excess of one year, plastic cannisters which support the reel at the hub are strongly recommended. These provide an additional level of protection against dust, handling, environmental changes and water and smoke effects when automatic fire extinguishing equipment is triggered.

10. Buildings housing tape should be protected by lightning arrestors.

Storage Periods, Maintenance and Recovery Procedures

1. *Shelf Life*— Magnetic tape is not now considered an archival medium. While improvements in both the medium and devices for reading tape have been substantial and frequent over the years, the great majority of computer users have at least some tapes over five years old. Studies conducted by NARS show that approximately 20% of a given population of tape is scrapped each year. This is primarily due to operating problems such as dropped reels, defect accumulation with usage due to stretching of the tape and dust or oxide becoming embedded in the medium, etc.

In addition, there are actual effects of deterioration in storage due to time alone, even when magnetic tape is stored in optimal environments. For these reasons, the present shelf life of magnetic tape is estimated at about 12 years. Magnetic tapes being produced since 1971 (particularly the premium tapes) appear to have a shelf life which may approach 20 years.

All studies of magnetic tape stored for extended periods of time show that defects, both temporary and permanent, tend to increase with time in storage. The buildup of defects in storage is approximately an exponential function. That is, tape defects double with each year in storage. These rates start at less than one per reel in the first year for tapes manufactured prior to 1967 to less than one per four reels in current production tapes.

The mechanism by which magnetic tape deteriorates in storage is as follows:

(1) Minor defects become permanent errors due to plastic cold flow from nonuniform and excessive stress build-up in the tape when the tape is subjected to changes in temperature and humidity. These defects are commonly referred to as lipped edges, hard bands and defect embossments (dimples).

(2) Different rates of expansion in the length and thickness directions of the tape due to temperature and humidity changes produce stresses which permanently deform the tape. These defects are commonly referred to as cinching or windowing.

Experimental evidence shows that current production magnetic tapes are less sensitive to these environmental changes than earlier tapes. Proper periodic maintenance of magnetic tape in storage will keep the development of defects on magnetic tape recordings down to a negligible level and detect trouble in time to recover all of the recorded information.

2. *Periodic Rewinding and Physical Inspection*— The buildup of defects can be largely eliminated as long as the medium has not deteriorated. This is accomplished by periodic rewinding under constant or programmed tension. Precision winders are manufactured by several manufacturers which will unwind and rewind a 10½ inch reel in approximately five minutes. This operation will redistribute the stresses in the tape and tend

to eliminate some imperfections that have been formed during storage. The recommended period between such operations is one year. At the same time, any physical deterioration can be noted by the operator and further testing of suspect tapes initiated.

3. ***Periodic Test Playing of Sample Tapes from Inventory***— Magnetic tapes do not fail suddenly. Rather, deterioration is noticed by a gradual accumulation of defects both of the temporary and permanent type. Therefore, annual playbacks of a sample of tape records is sufficient to spot deterioration of recordings and to allow for corrective action and recopying to occur.

4. ***Visual Inspection Criteria—Causes and Recovery Procedures***— Defects visible while tape is removed from cannister but has not been mounted on a playback machine:

5. *Poor wind:* This is manifested in two ways. Cinching is a separation of adjacent layers of tape in the wrap with a corresponding crosswise wrinkle in the tape. This condition will lead to defects in the section of tape around the defect. It is most common in files shorter than a full reel. This trouble is also located mostly near the end of the tape. In full reel recordings, the condition is caused by excessive temperature and humidity variation during shipment.

The second visible symptom of a poor wind is protruding layers of tape from the pack. This will cause edge damage. The tape pack should also be equidistant between the reel figures. If it is not, there is a strong possibility that the reel was mishandled in shipment such as dropping or left lying on its side in a high vibration shipping mode.

Both of these symptoms, if seen, require an immediate pass of the file on a cleaner rewinder followed by a day in dead storage for stress relief and a subsequent rewind pass. After the second rewind pass, the reel may be played to see if any information loss occurs.

Broken flange, hub, or cannister: All are indications of excessively rough handling and shipping or shelving operations. If the reel is broken, the tape pack should be immediately transferred to a new reel before any testing and recovery procedures are attempted. After the file is mounted on a new reel, perform the corrective procedures above.

Color changes or spots in the tape pack as seen from the side: This is almost invariably a sign of a chemical reaction between the oxide binder and whatever may have been packed with the reel. Chemicals may be in any of the following items: adhesive on labels, inks, felt tip pens, paper and the rubber or vinyl stoppers which hold the tape leader down.

At one time or another, almost all of these substances have been known to generate gases which have reacted with the binder composition and resulted in oxide pull-out. No recovery procedures can salvage information lost in this manner. The only recourse is to recreate the tape from backup copies. For this reason, the only extraneous items which should be packed with a tape reel in a cannister are new stoppers and self adhesive labels designed specifically for tapes.

6. *Defects visible at point where tape proves unplayable—Recovery Procedures:* Some visible defects are curable to the extent that a good copy may be made. Others by their very nature indicate a total loss of recording at the point of trouble.

a. *Oxide pull-out—No recovery possible:* The visual symptom is a spot on the tape with missing binder which may have been transferred to an adjacent layer of tape.

b. *Surface contamination and dimples:* Dirt wrapped into a reel will usually create dimples over time in adjacent layers of tape. Remove the tape and exercise it by two to five cleaning passes followed by a one-day stress relief storage period. Following this period exercise the tape for up to 20 passes on the machine which is to play it.

c. *Creases and scratches:* Use same procedure as above. Creases are usually caused by poor wrap in the tape pack. These are aggravated by poor handling and environmental conditions.

d. *Embossments in tape wrap:* Under high pressure generated by both high temperature and humidity and cycling, the end-of-tape marker can generate embossments and irregularities in the last few wraps of tape in a reel.

e. *Torn tape in middle of pack:* This is a sure sign that the tape has been subject to temperature and humidity extremes either in storage or transit.

f. *Adhesion and blocking:* Adhesion of adjacent tape layers is due to static buildup on tape surfaces and storage of tapes in extremely dry conditions. Low humidity conditions are often due to not procuring humidifiers in conjunction with air conditioning equipment. Recent designs of both tape playback equipment and tapes have greatly reduced this phenomenon.

Blocking has no recovery procedure. Excessive humidity and temperature will cause the inner half inch of a tape pack to become a solid mass of mylar and binder. It can only be prevented by proper environmental conditions.

Effect of Poor Environmental Conditions on Magnetic Tape and Recordings

Experimental evidence shows that the environmental conditions listed below usually cause playback problems in a matter of weeks.

1. *Temperature and humidity cycling in warehouse grade space:* Magnetic tape has a relatively high coefficient of expansion with respect to both temperature and humidity. This means that very large stresses are built up in the tape pack when it is subjected to temperature and humidity changes. This is true even though the actual temperature and humidity values may be within the limits specified for the tape. Typical conditions almost guaranteed to cause trouble are cycling between 55° and 95° F. during a six-month storage period or between 50% and 10% humidity. A warehouse may have temperature controls but does not usually have provision for adding humidity in the winter. Under these conditions, tape will shrink. This shrinking causes increased pressure inside the pack and tends to set dimples in the tape in layers adjacent to imbedded dirt.

Two other effects of such cycling are a result of storing tape removed directly from tape machines. If the recording is less than a full reel, there is a winding tension difference between adjacent layers of tape at the end of the last recording. The environmental cycling causes a shift of the entire pack at this point generating wrinkled tape near the end of the tape. This phenomenon is known as cinching.

The second effect of cycling is on tapes with protruding layers of tape in the middle of the pack. These changes in environmental conditions cause unequal compression of these layers. This results in such defects as tape creases and lipped edges. In general, several feet of tape can be damaged this way making recovery of information very difficult.

2. *Excessive temperature and humidity:* This combination of conditions occurs in non-air-conditioned space. The effect is to cause blocking of the tape and layer to layer adhesion. The newest tapes are less sensitive to these conditions than older tapes, particularly those purchased prior to 1967.

3. *Very dry conditions:* This causes adhesion of adjacent layers of tape due to static buildup on the tape backing surface. One additional trouble this kind of tape will generate is an attractiveness for dust.

4. *Effect of time:* Since magnetic tape is a plastic, it exhibits the phenomenon of cold flow over time. Magnetic tape taken directly from a playback machine will have various unequal stress and strains wound into it while on the machine. In storage, these will tend to equalize themselves by stretching of the tape in unequal amounts. These changes are reversible up to a point and can be virtually eliminated with periodic rewinding at one-year intervals. If this is not done, the most characteristic defect will be a curvature in the tape leading to misalignment of the tape when going under the heads or actual skew.

5. *Strong magnetic fields:* Tapes must be stored to *avoid very close proximity* to stray, highly powered magnetic fields, such as a bulk degausser which produces a highly concentrated field of 1500 oersteds. Laboratory tests have been conducted to determine what would constitute adequate protection. It was found that field strengths of more than 1500 oersteds would not be encountered in ordinary storage or shipping situations. Magnetic field intensity decreases rapidly with distance from the source. It was found that the degree of erasure at a distance of (3) three inches was almost immeasurable and that a 1500 oersted 60 cycle electromagnetic source is reduced to the 50 oersted point.

To obtain this data the magnetic tape was first exposed to an electro-magnetic field at varying distances and erasing effects measured. It was found that it was extremely hard to obtain any meaningful measurements at more than (3) three inches from the magnetic source. All tests have indicated that magnetic field strengths within the tape of 50 oersteds or less cause no measurable erasure and the tape is unaffected by stray magnetic fields. To obtain accidental erasure protection during shipment or during storange of magnetic tapes, simple physical spacing, of 3 inches or more from any electro-magnetic source is the easiest and least costly method suggested.

Magnetic Tape Quality Over the Years

Magnetic tape has been improved greatly in the last fifteen years. Even the lowest grade of current production tape is superior to the premium tapes of even eight years ago. The following paragraphs describe the changes in magnetic tape quality factors during the 1960s.

1. *Oxide shed*— Early tapes generated many dropouts due to shedding of particles of oxide from the surface coating. These particles were rubbed off at the heads and would periodically drop off in clumps and get wound into the tape wrap. Newer tapes have almost eliminated this problem by being much smoother. Current tapes have a surface roughness of one to six micro-inches compared to double that in the early 1960s. Formulation of the binder and oxide grain itself is also much better, resulting in less trouble and wear from this source.

2. *Deterioration of oxide coating*—Some tapes manufactured between 1962 and 1964 had fungicides in their formulation. Many of these tapes have deteriorated in storage since the fungicide was not a stable compound. The symptom here was for the entire coating to peel off in chunks. This manufacturing practice was eliminated in all post 1964 production tapes.

3. *Sensitivity to environmental changes in temperature and humidity:* Cycling tests show that both temporary and permanent errors have been reduced by 75% between 1965 and 1968 production tapes.

Even if some dirt is embedded in current tape, only one or two wrap layers will show dimpling. Also fewer cleaning and exercising passes are required to restore the surface of the tape for data recovery to take place. Additional changes in the coefficient of friction between the backing and oxide surfaces result in less defects showing up after poor environmental storage; particularly cinching and tearing.

4. *Sensitivity to dryness:* Tapes stored in low humidity have often generated much static electricity on the tape surface. Over the years, surface resistance of both oxide and mylar surfaces have been reduced. The result is a bleed off of the electrostatic charges and less attraction for atmospheric dirt or adhesion of adjacent tape layers during playback.

Fire Protection

Magnetic tape, tape reels, and containers are all extremely susceptible to heat, steam, and fire and also are potential contributors to fire. Tape reels and containers should be made of fire resistant materials when possible. All rooms and areas in which tapes, reels, and containers are to be used or stored must, therefore, provide for protection against fire as one of the major considerations.

1. No open flame (matches, cigarette lighters) or smoking should be allowed in tape handling areas. Smoke particles deposited on the tape have been known to cause dropouts.

2. Tape vaults must be insulated to provide fire resistance limits up to 150° F. temperature and 85% relative humidity.

3. Combustibles such as wood, paper, volatile cleaning fluids, etc., must be kept to a minimum in tape storage areas.

4. The use of CO_2 (Carbon Dioxide) extinguishers and H_2O (water) are recommended in fire extinguishment. The use of water requires that all tapes must be carefully dried within 24 hours to avoid "cupping and blocking."

Effects of Nuclear Radiation

1. *Physical effects:* Studies have indicated that the effects of gamma and/or beta dosage on the physical and magnetic properties of magnetic tape causes little or no physical damage up to the 50-megarep level. Above the 50-megarep level Polyester base materials begin to show some physical deterioration. The tape backing and coating will show significant embrittlement (easily broken, cracked or snapped) and life of the tape could be reduced by as much as 60%.

2. *Magnetic properties:* It has been determined that magnetic tape will be *unaffected* by nuclear radiation until the dosage approaches a level at least 100 megareps (Note: Megarep equals 1 million roentgen equivalent physical). Radiation of that magnitude would only increase the layer-to-layer "print-through" by approximately 4 db. This print-through effect is so slight that it is not considered serious, and would not prevent retrieval of the information stored on the tape.

This amount of radiation, 100 megarep, will also have some effects on the tape coating. The effect of Neutron bombardment on the coating (iron-oxide and binder) would no doubt be limited to activation of the iron-oxide coating, which would produce a radioactive isotope that itself might become another source of radiation. It is theorized that such activation would not produce a change in the overall magnetic properties of the coating.

Handling Tape In Active Areas

1. Tapes should not be touched with the fingers, (the use of lint-free gloves is recommended where

an unusual amount of handling occurs).

2. Working areas should be devoid of all substances that can adhere to the tape causing dust and lint to collect. Among those substances are such common items as cigarette ashes, food, drinks, floor and other types of waxes.

3. No eating or smoking in tape storage areas. Food particles can be just as harmful as smoke particles.

4. Tapes should be handled in a careful manner, not pulled, yanked, squeezed, or scratched, and they should be protected against heat changes and fire hazard during all transportation operations.

5. Tapes, reels or containers should not be thrown or dropped, when either empty or full.

6. Replace any old or damaged reels and inspect all take-up reels weekly.